50PC1DR

Overview of Topics to be Discussed

- Switch Mode Power Supply
- Y SUS Board
- Z SUS Board
- X Drive Boards

Safety & Handling Regulations

1. Approximately 10 minute pre-run time is required before adjustment.
2. Do not exceed Higher voltage than is required for the product.
3. Be cautious of electric shock from the PDP module since the PDP module uses high voltage, and it is recommended that you should not touch the drive circuits for at least one minute because of residual current stored.
4. Circuit drive has c-mos circuits which should be protected from static electricity.
5. The PDP Module must be carried by two people.
6. Be careful of short circuit when measuring voltage.
7. Be cautious of screws and other metal objects to prevent short in circuitry.

Checking Point before Requesting MODULE Repair

1. Check the appearance of Panel and boards.
2. Check the model label. Verify model names and board model matches.
3. Check details of defective condition and history.

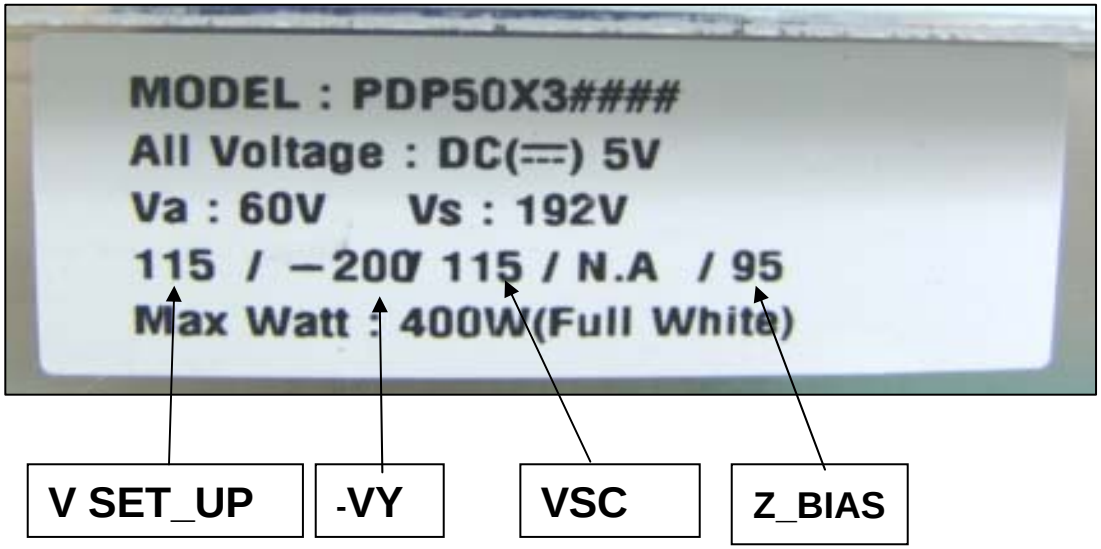
   Ex) COF long 2-1 fail, address 1 line open, Y b/d trouble, Mal-discharge on screen.

Switch Mode Power Supply Troubleshooting

This Section of the Presentation will cover troubleshooting the Switch Mode Power Supply for the Single Scan Plasma. Upon completion of the section the technician will have a better understanding of the operation of the Power Supply circuit and will be able to locate voltage and test points needed for troubleshooting and alignments.

- **DC Voltages developed on the SMPS**
- **Adjustments VA, VS, and 5V DC**

- Always refer to the sticker located in the upper right side of the PDP for the correct voltage levels for the DC 5v, VA, VS, V SET UP, -VY, VSC, and Z Bias as they will vary from Panel to Panel.



Troubleshooting Steps

- Define Look at the symptom carefully and determine what circuits could be causing the failure. Use your senses Sight, Smell, Touch and Hearing. Look for burned parts and check for possible overheated components. Capacitors will sometimes leak dielectric material and give off a distinct odor. Frequency of power supplies will change with the load, or listen for relay closing etc.
- Localize After carefully checking the symptom and determining the circuits to be checked and after giving a thorough examination using your senses the first check should always be the DC Supply voltages to those circuits under test. Always confirm the Supplies are not only the proper level but be sure they are noise free. If the supplies are missing check the resistance for possible short circuits.
- Isolate To further isolate the failure check for the proper waveforms with the Oscilloscope to make a final determination of the failure. Look for correct Amplitude and Timing of the signals also check for the proper Duty Cycle of the signals. Sometimes “glitches” or “road bumps” will be an indication of an eminent failure.
- Correct The final step is to correct the problem. Be careful of ESD and make sure to check the DC Supplies for proper levels. Make all necessary adjustments and lastly always perform a Safety AC Leakage Test before returning the product back to the Customer.

SMPS Operating Modes

- **Deep Sleep Mode** - Guide Plus not programmed or Cable Card not installed and set is plugged in and turned off. The SMPS outputs S 5v (Standby). Guide Plus has been programmed the set will remain in Standby Mode when turned off for approximately 2 hours and go into Deep Sleep Mode. The unit can be taken out of DS Mode as needed for TVGOS Data.
- **Standby Operation -** Guide Plus has been programmed or a Cable Card is installed and unit is powered off the SMPS will output 19v,12v, 6v, 5vS, and 3.3v Supplies.
- **Full Power On** - SMPS outputting all of the Standby Voltages and the VA, VS, and 5v DC, set in full operation.

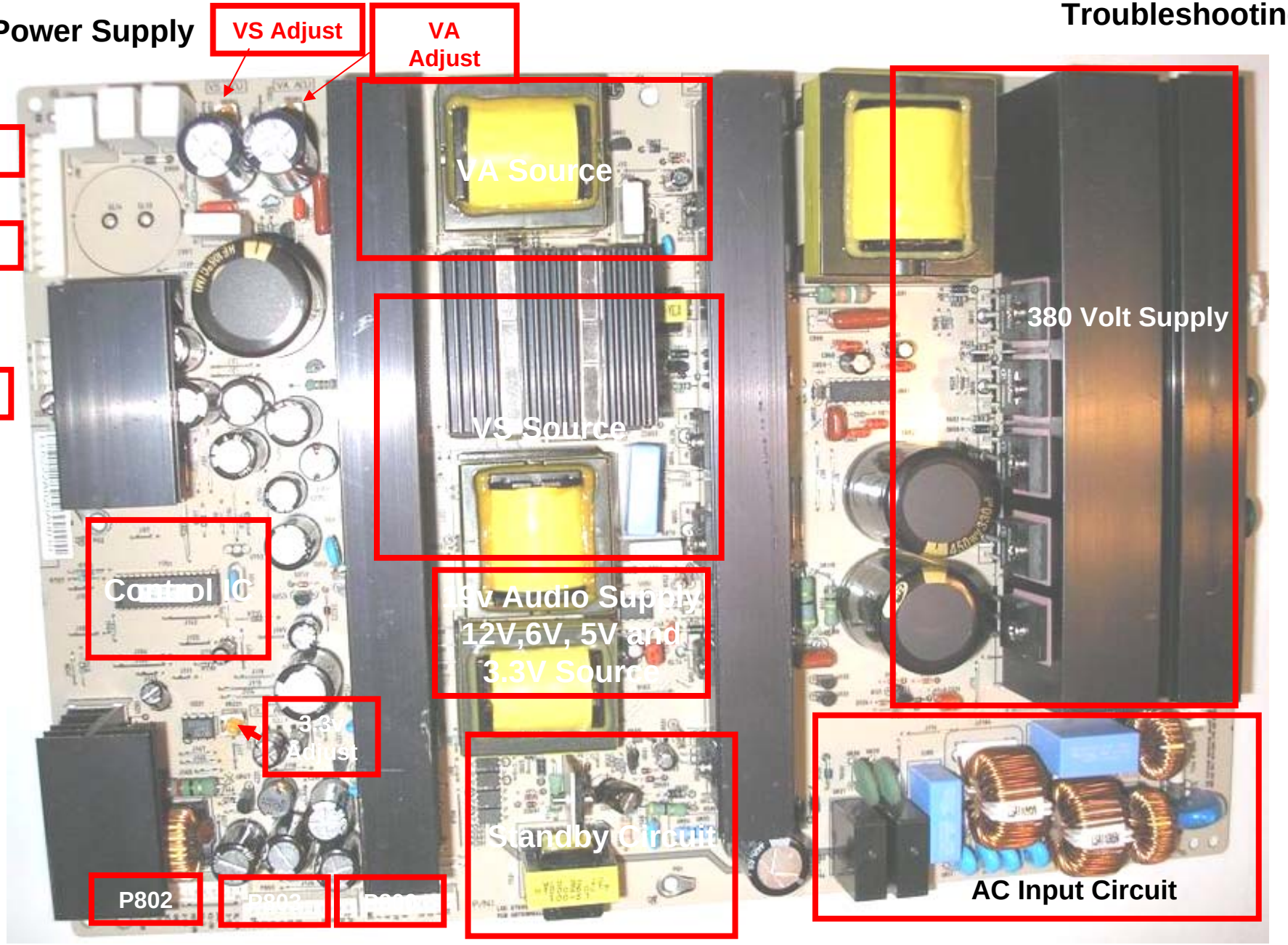
Power Sequence

- AC Cord Plugged in – Standby 5v
- AC Detect sent from the Power Board Pin1 of P800 to the Digital Board. Needed to enable the Micro Processor to output the RL-ON Signal to turn on the SMPS.
- Digital Board sends RL-ON to P800 Pin 2 to cause Controller IC U701 on the Power Board to turn on the Relay Drive Transistors Q701 and Q702 closing the Relays RL101 and RL102 turning on the 3.3V, 5V, 6V, 12V, and 19V supplies.
- VS-ON applied from the Digital Board to the Power Board on connector P800 Pin 5 used to turn on the VA, and VS Supplies
- 5V-M Sent from the Digital Board to the Power Board to turn on 5V-DC.
- 5V-D is sent from the Digital Board through P800 Pin 6 and used to bring the Power Supply out of Deep Sleep Mode.

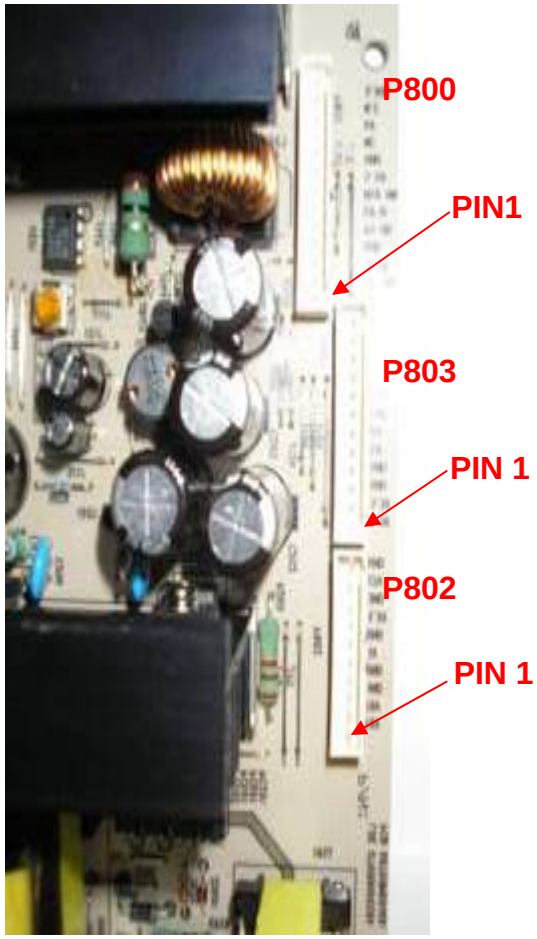
Switch Mode Power Supply (SMPS) Voltages

- VS 196v used to drive the Horizontal Grid Voltage, Y SUS, and Z SUS. Measured from pins 8, 9, and 10 of connector P805 to chassis ground. Adjusted at VR951
- VA 60v used to drive the Vertical Grid Voltage, X Boards and in the IPM Circuits to develop Y and Z Drive waveforms. Measured from pins 1 and 2 of connector P805 to chassis ground. Adjusted at VR901
- 5v.DC Used to develop bias voltages for the circuits on the Y SUS, Z SUS, X, and Control Boards. Measured from pins 1 and 2 of connector P804 to chassis ground.
- 3.3v. Standby voltage applied to the Analog, and Digital Boards to Bias the Signal and Control circuits. Measured at connector P803 at pins 1 and 2. to chassis ground. Adjusted at VR221.
- 19v Applied to the Analog Board and used for the Audio Output Supply, present in standby. Measured at P802 pins 1 and 2 to chassis ground.
- 12v Used for supplying low voltage regulators on the Digital and Analog Boards, present in standby. Measured at P803 pins 9 and 10 to chassis ground.
- 6v Applied to the Digital Board used for the signal processing circuits present in standby. Measured at P803 pins 5 and 6 to chassis ground.
- S 5v Standby 5 volts at P800 pin 3 applied to the Digital Board.
- VS- ON Switched 5 volts at P800 pin 5 present after power up to switch on the VA, VS, and 5V on the Power Board from the Digital Board.
- 5v-D Switched 5v used to bring the Power Supply out of Deep Sleep Mode.
- 5V-M Needed to turn on the 5V-DC Supply.

Power Supply



Power Supply
Low Voltage Connectors

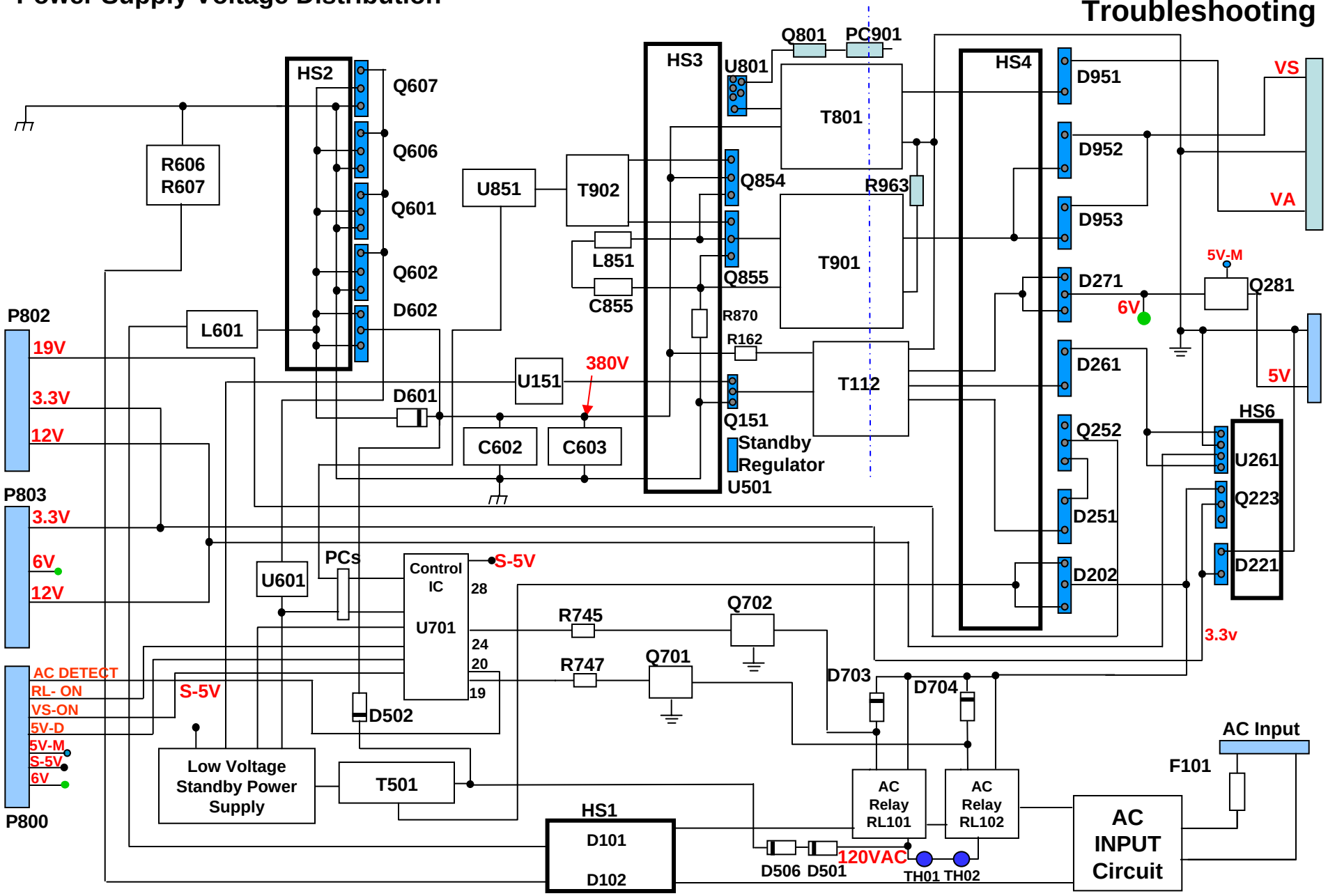


P800
1) AC-D
2) RL-ON
3) S-5V
4) GND
5) VS-ON
6) 5V-D
7) M5V-ON
8) S-5V
9) GND
10) NC
11) 6V
12) N.C
13) 3.3ON

P803
1) 3.3V
2) 3.3V
3) GND
4) GND
5) 6V
6) 6V
7) GND
8) GND
9) 12V
10) 12V
11) GND
12) GND

P802
1) 19V
2) 19V
3) GND
4) GND
5) 6V
6) GND
7) 3.3V
8) GND
9) 12V
10) GND

Power Supply Voltage Distribution



Y SUSTAIN BOARD Troubleshooting

This Section of the Presentation will cover troubleshooting the Y SUS Board for the Single Scan Plasma. Upon completion of the Section the technician will have a better understanding of the operation of the circuit and will be able to locate voltage and resistance test points needed for troubleshooting and alignments.

- Adjustments
- DC Voltage and Waveform Checks
- Resistance Measurements

Operating Voltages

SMPS Supplied	VA 60v. VS 196v. 5v.
Y SUS Developed	VSC 115v. -VY -196v. IPM 18v. ER IPM SUS IPM Ramp UP V SET DN V SET UP

Important Note

- The following voltages and waveforms should be adjusted in the order they are presented.
- Always adjust the DC levels before the waveform adjustments to most accurately set the Plasma Display Panel.

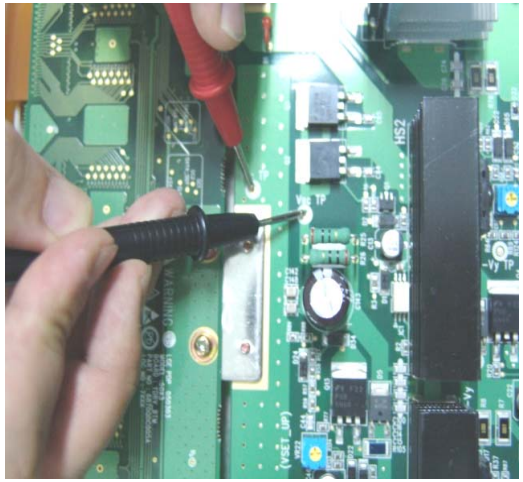
Voltmeter Adjustments to Y SUS

- VSC 115v Used to shape the Y Drive waveform by setting the V Scan level. Measured at the VSC test points.

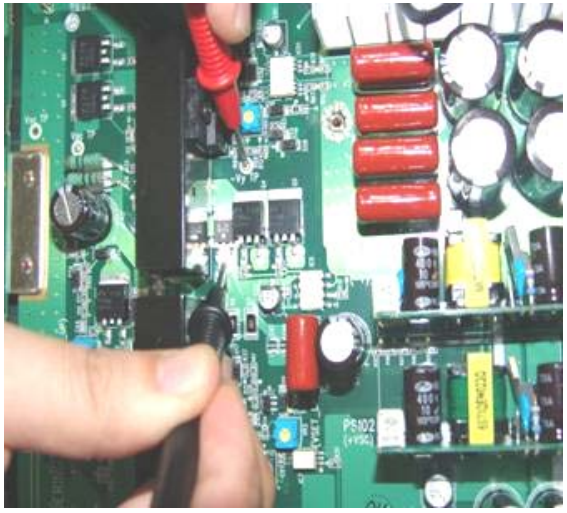
- -VY -196v Used to shape the Y Drive waveform by setting the negative excursion of the V Set

Check Y Sustain Board Output Voltage with the Voltmeter make sure the -VY and VSC are the same as the Voltage Label on the upper right side of the PDP.

Check VSC



Check -VY



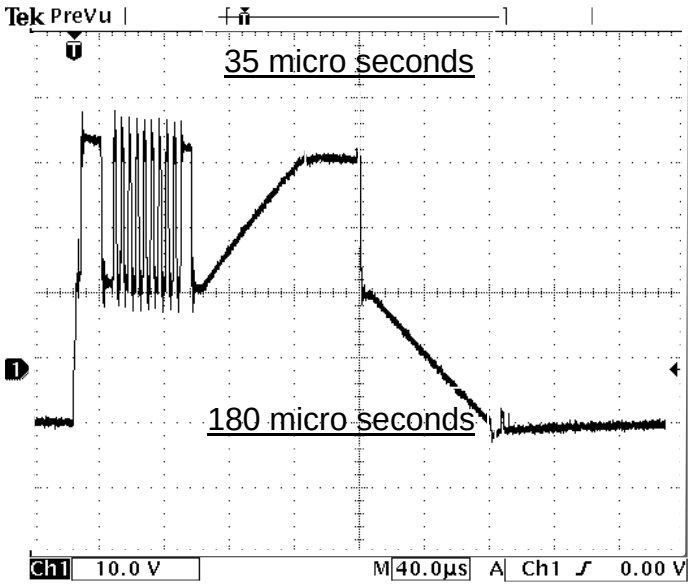
Waveform Adjustments Y SUSTAIN

- Ramp Up Used to shape the Y Drive Waveform by changing the pitch of the Top Ramp
- V SET DN Used to shape the Y Drive Waveform by changing the pitch of the Bottom Ramp
- V SET UP Used to shape the Y Drive waveform by leveling the Top Ramp

Troubleshooting Single Scan Panel

***Waveforms may vary with different Y_SUSTAIN PCB part #'s.**

Normal Waveform



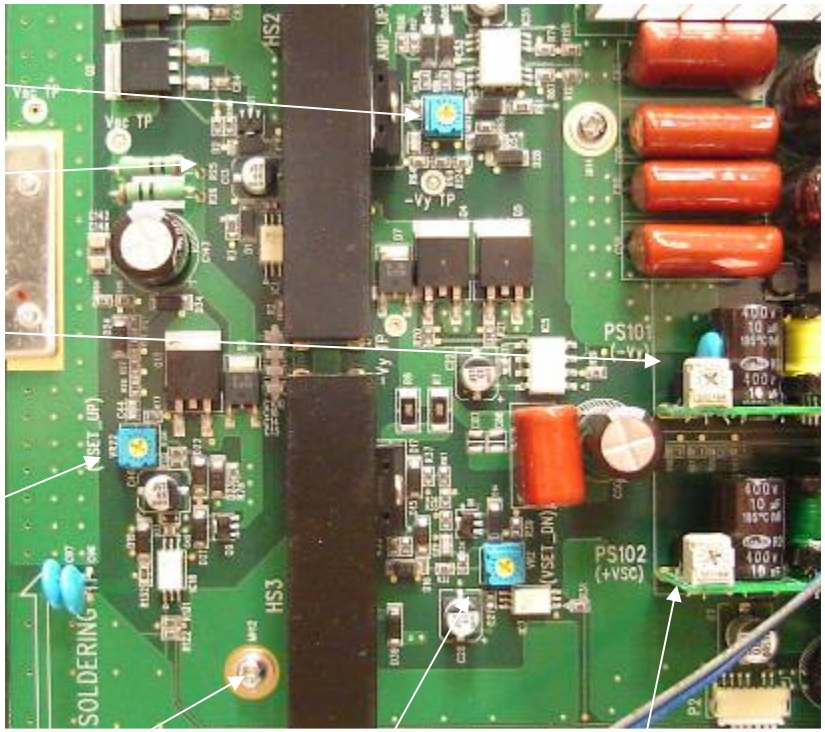
RAMP UP

Scope TP

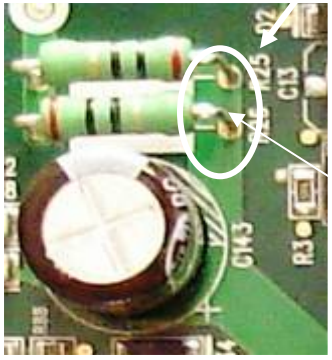
-VY

VSET UP

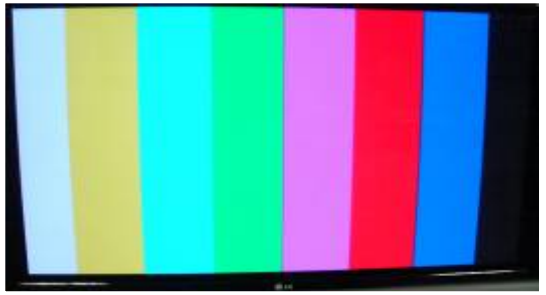
Panel Waveform Adjustment



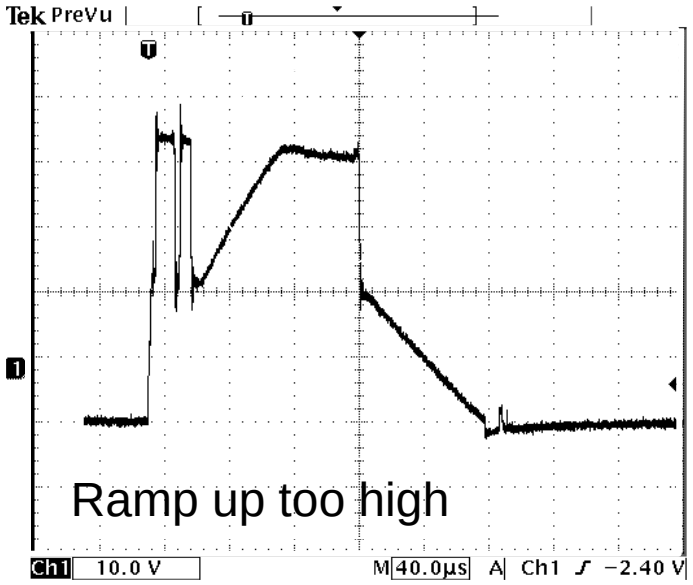
Ground VSET DN +VSC

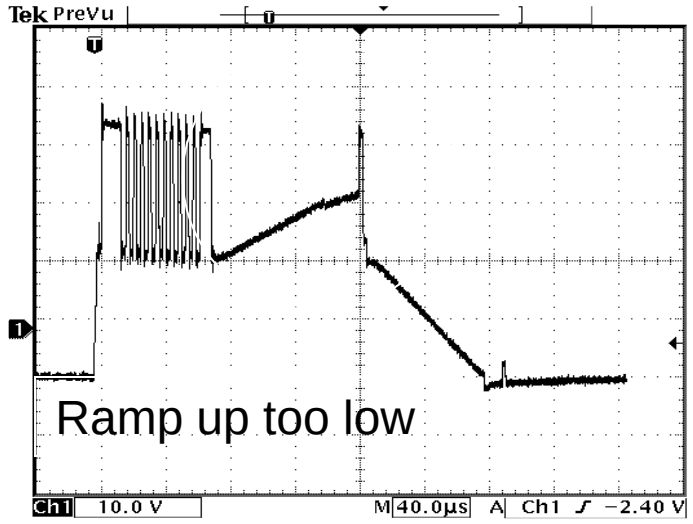


This test point is the reference for all the following signals referred to here. Readings are taken with the probe set to 10x1.

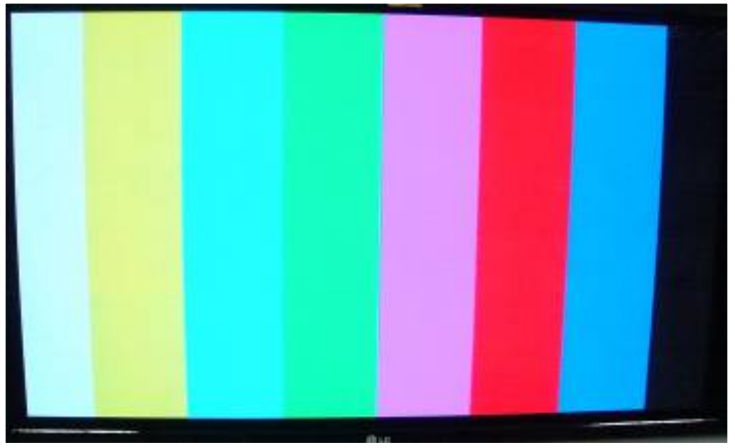


Troubleshooting Single Scan Panel

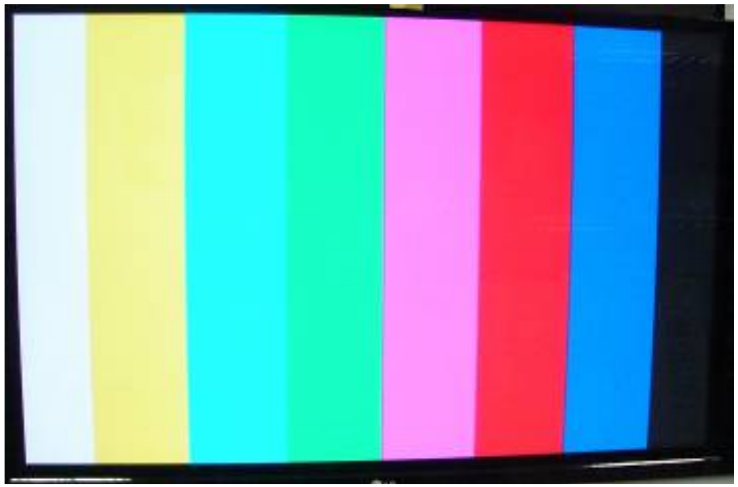




Panel Waveform Adjustment

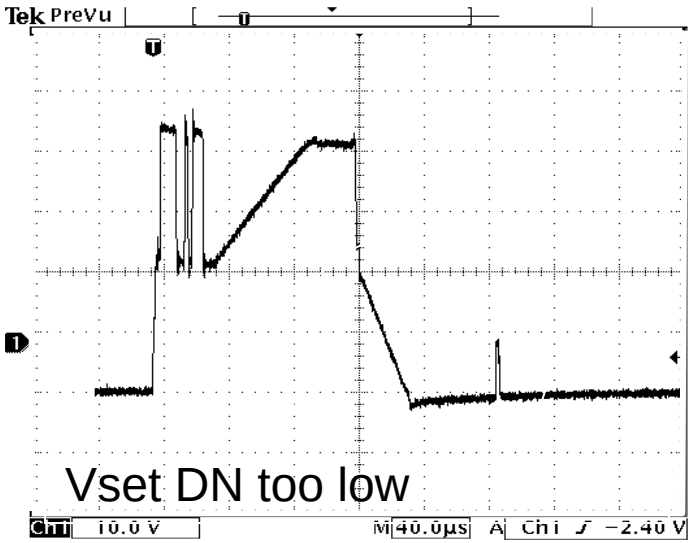


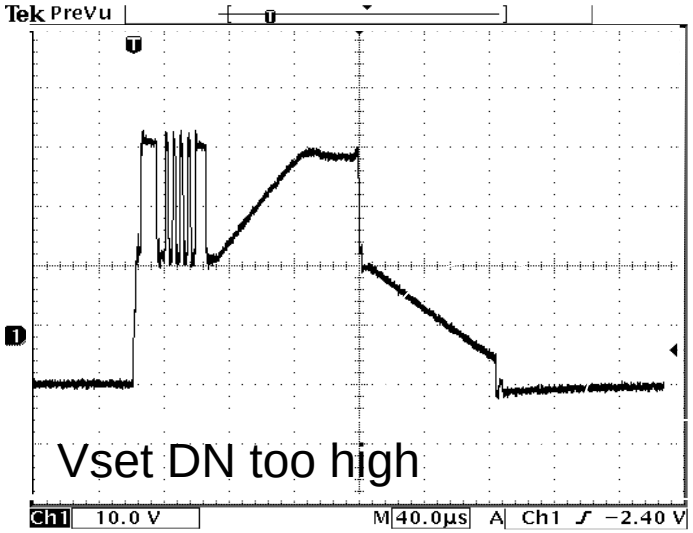
Noticeable low level color distortion with the **Ramp_up** too high.



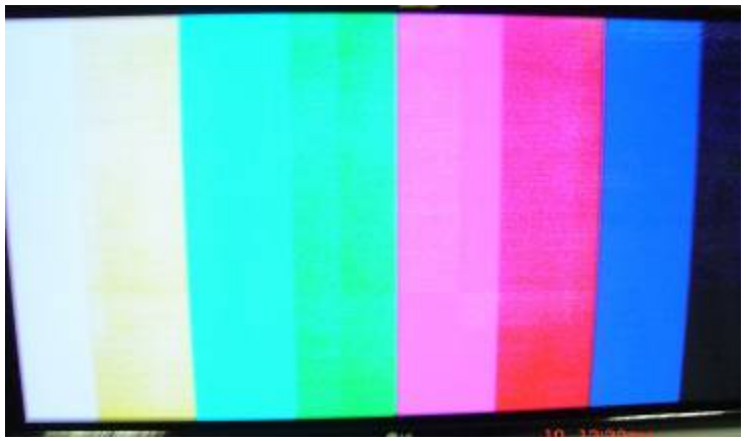
Noticeable low level color distortion with the **Ramp_up** too low.

Troubleshooting Single Scan Panel

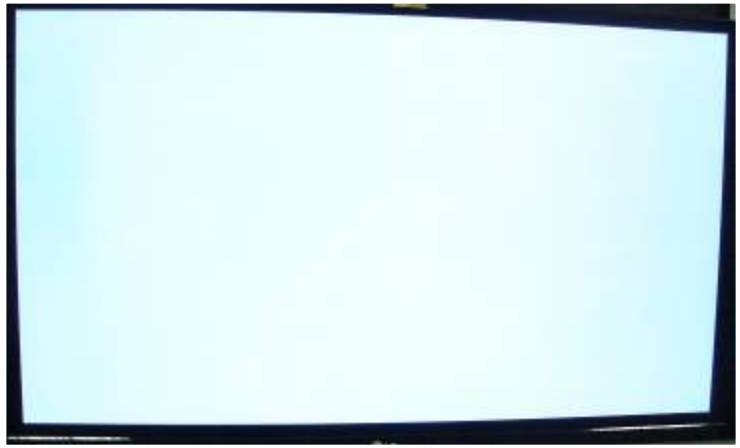




Panel Waveform Adjustment

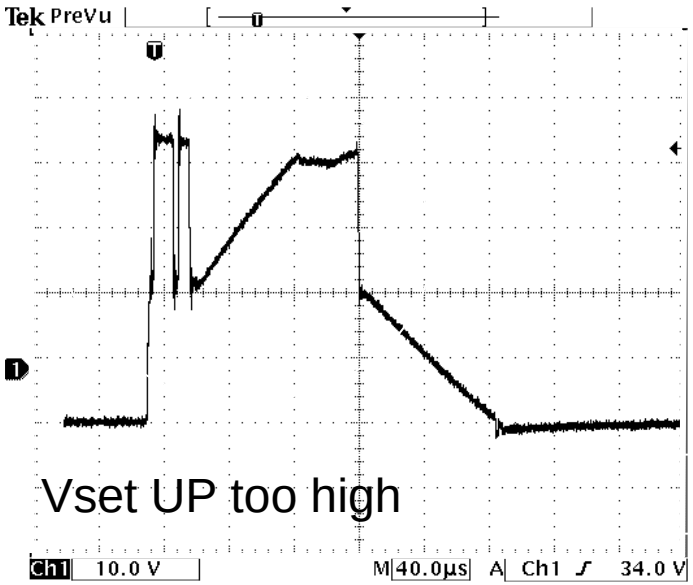


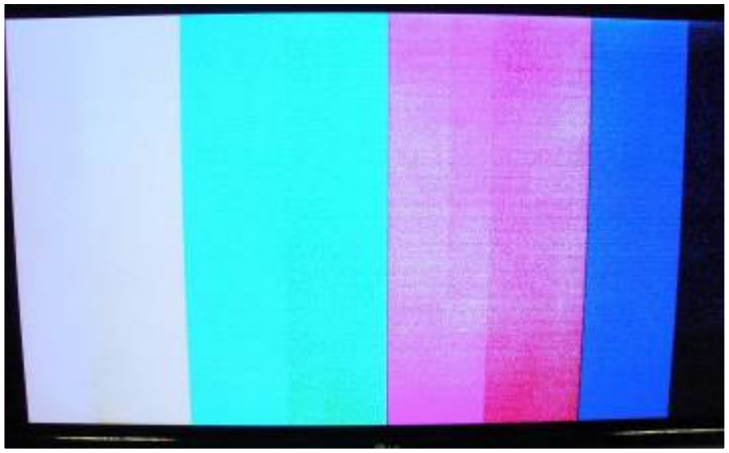
The center begins to wash out and arc due to decreased **Vset DN** time.



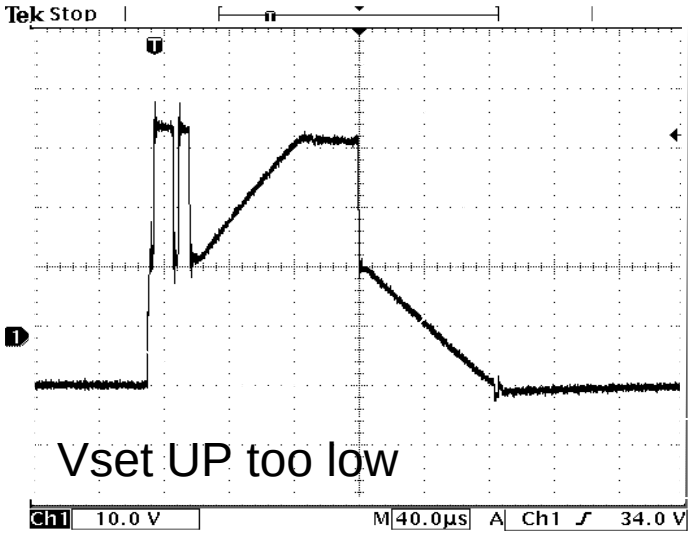
All of the center washes out due to increased **Vset_DN** time.

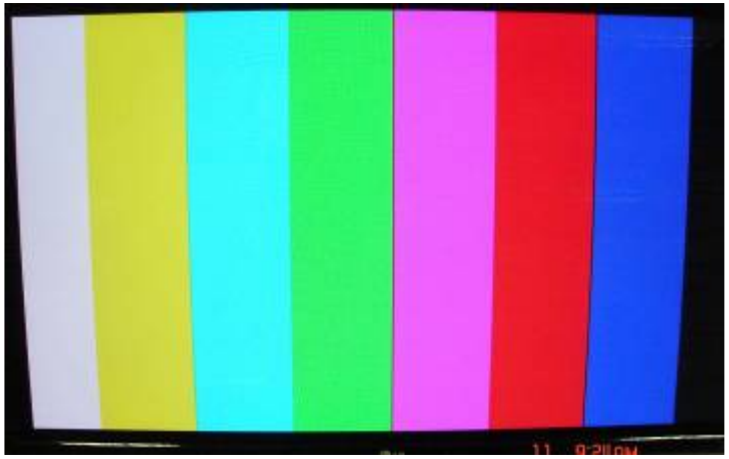
Panel Waveform Adjustment





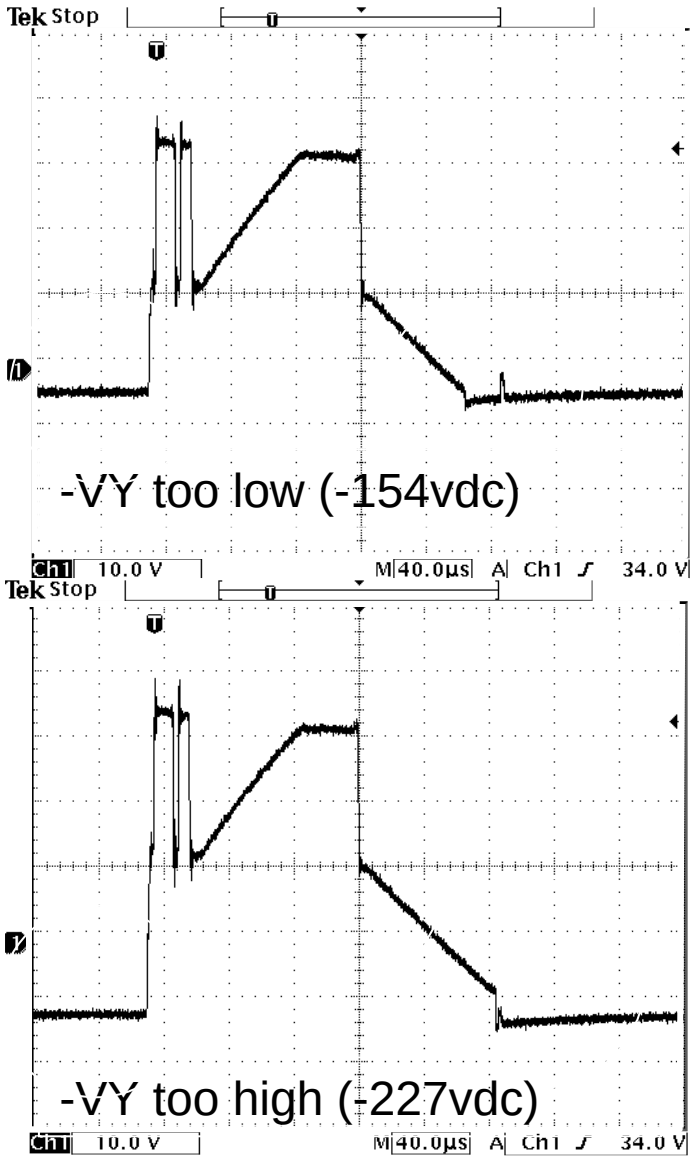
The center begins to wash out and arc due to **Vset UP** Peeking too late and alters the start of the **Vset DN** phase.



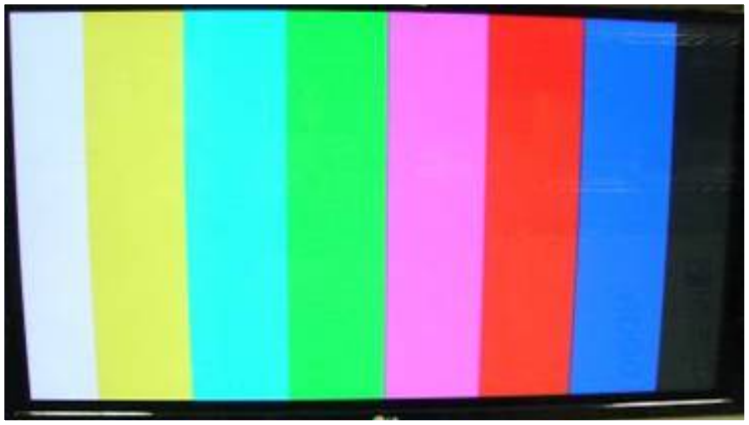


Very little alteration to the picture, the wave form indicates a distorted **Vset UP**. The peek widens due to the **Vset UP** peeking too quickly.

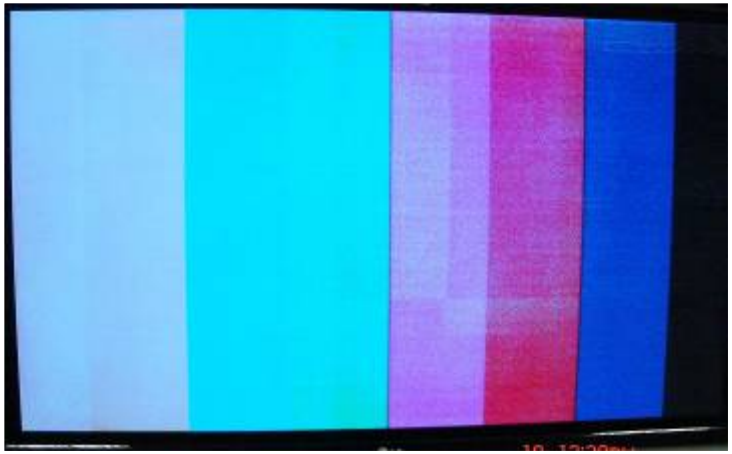
Troubleshooting Single Scan Panel



Panel Waveform Adjustment

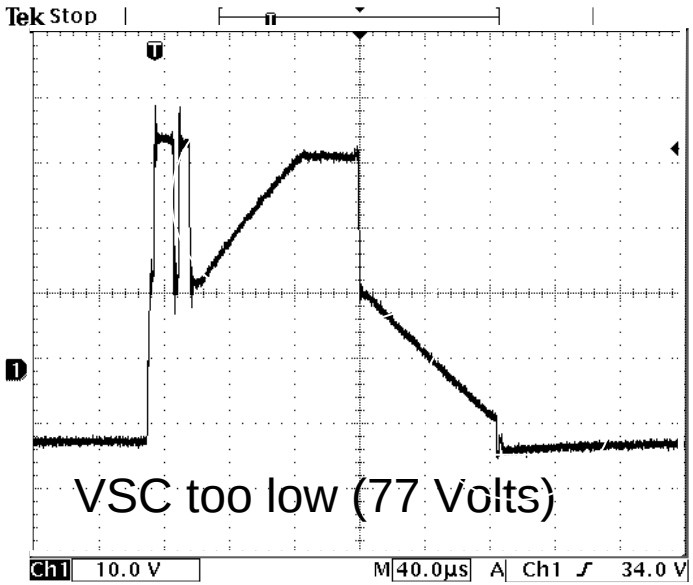


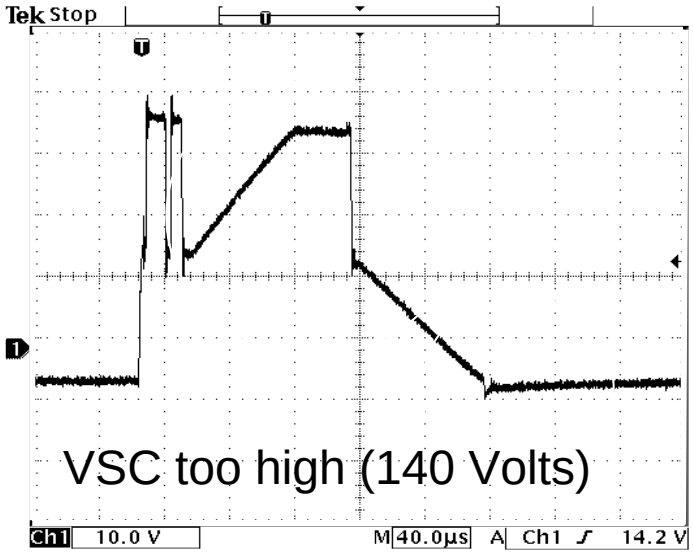
Colors and the image will bloom slightly and the unit will have difficulty with clean frame changes in a quickly altering image.



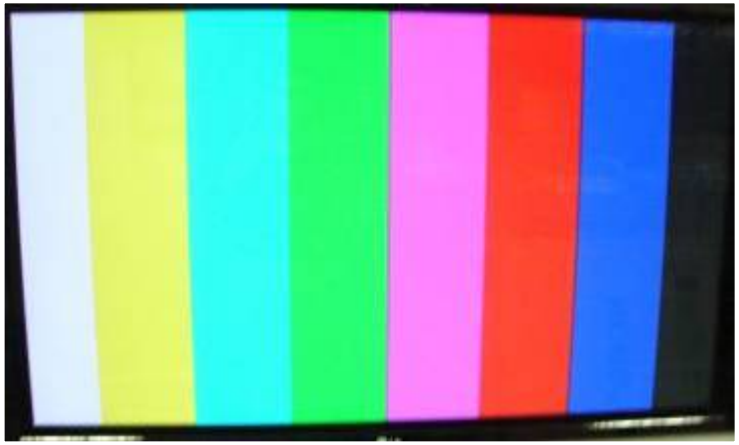
The center begins to wash out and arc due to – **VY** running to long and clipping.

Troubleshooting Single Scan Panel

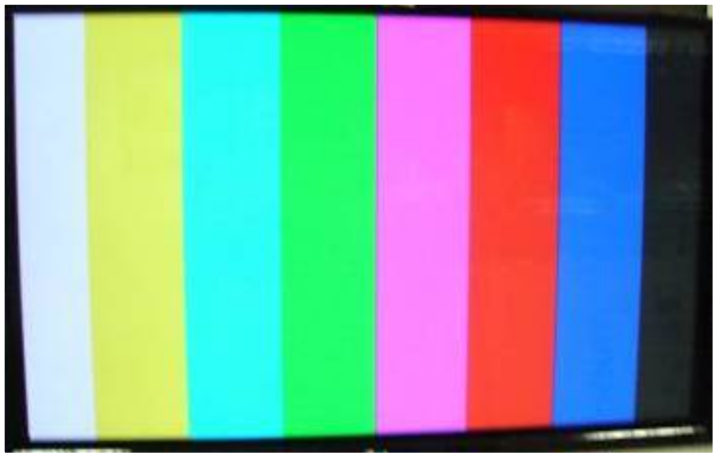




Panel Waveform Adjustment

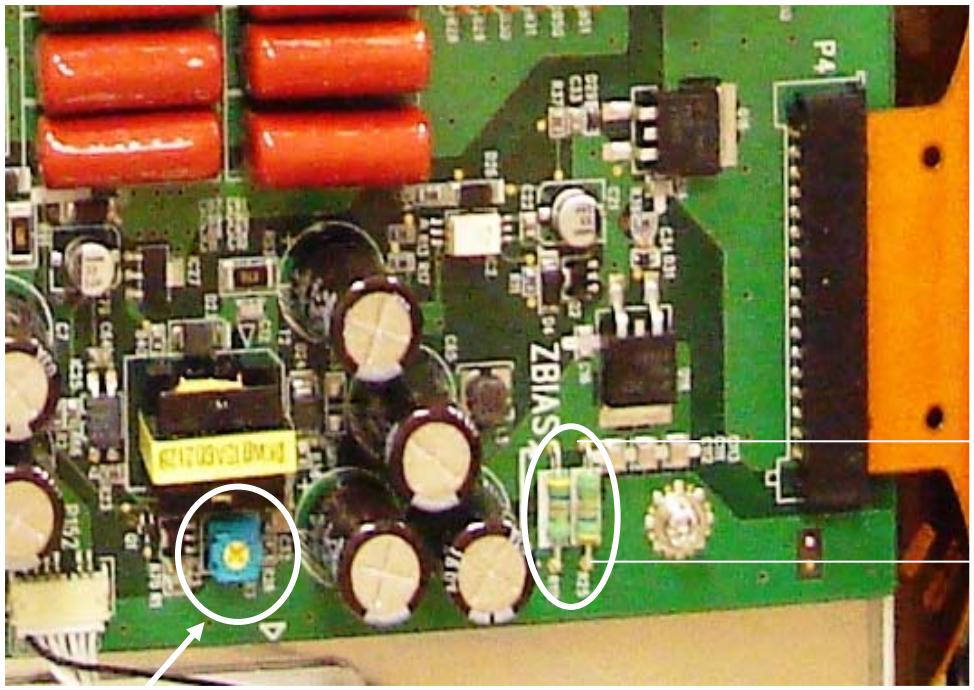


The image will show very little change but there will Be some distortion in a quickly changing image.



The image will show very little change but there will Be some distortion in a quickly changing image.

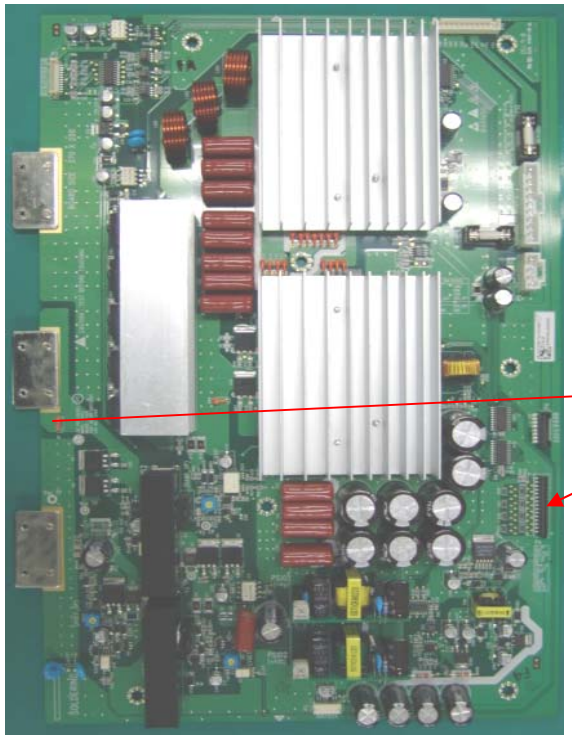
SINGLE SCAN PDP 50PX3



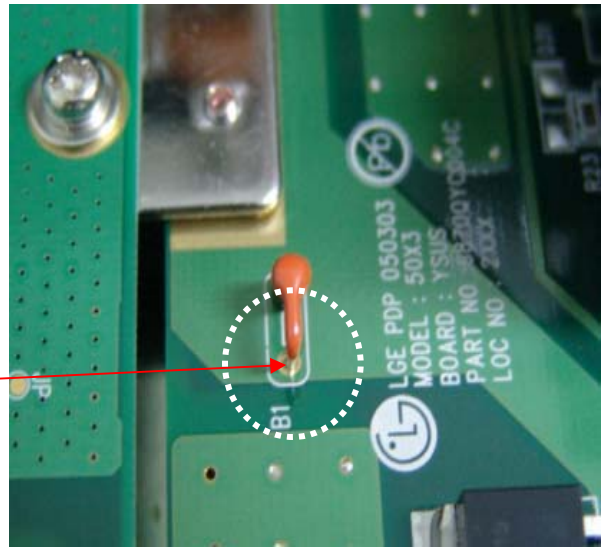
ZBIAS adjustment: On the Z-Sustain PCB
With the DVM across R92 adjust the potentiometer till the DVM reads 93 vdc.

Y sustain board

Control Board supplies Logic Signals to the Y Sustain Board for processing, which then develops the signal to drive both of the Y Drive Boards sequentially with the Y Output Waveform for PDP operation.

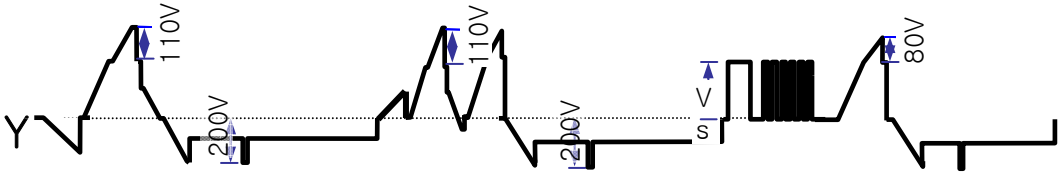


Logic signals from Control Board



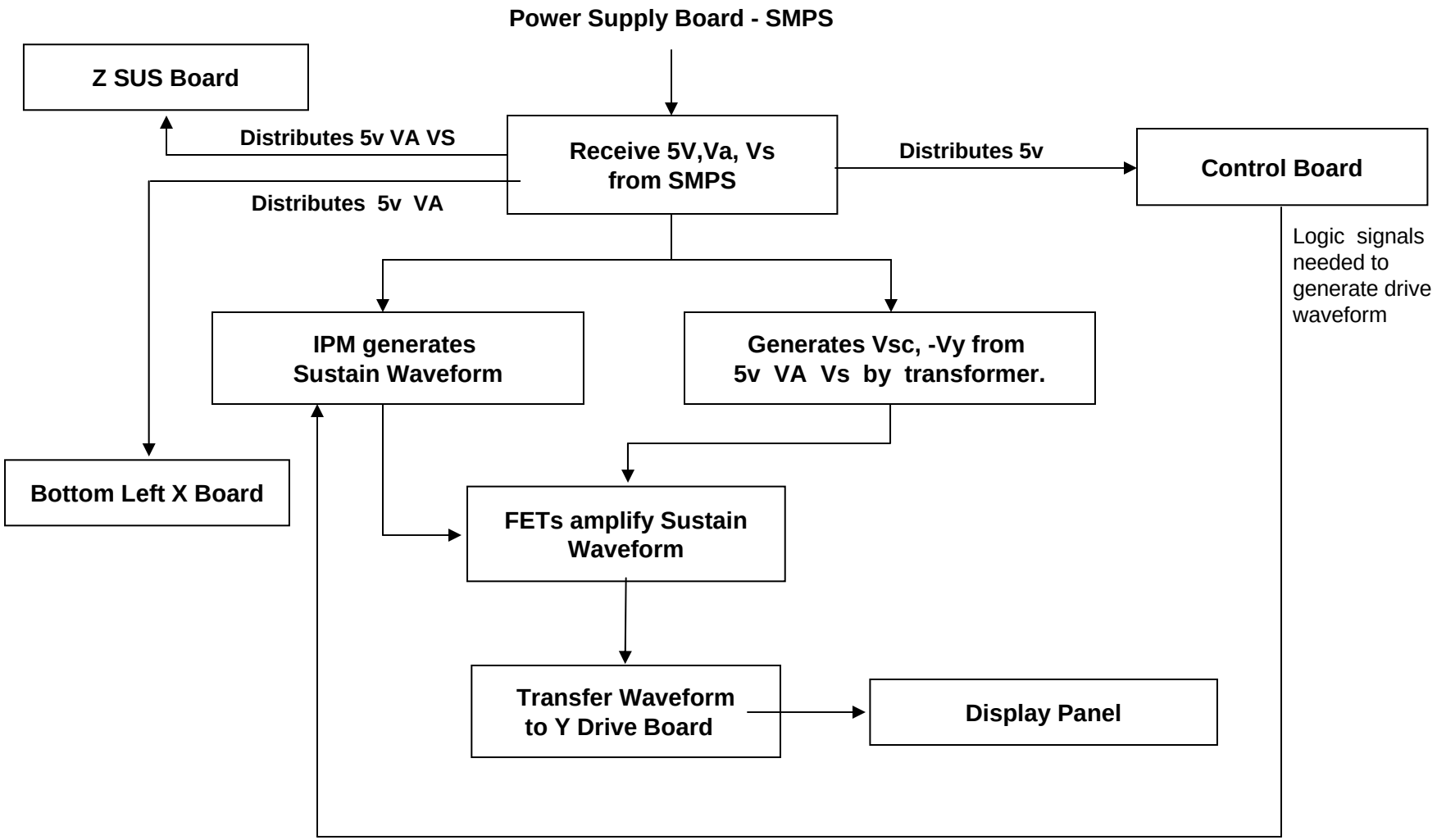
< Probe connect point to Oscilloscope to check Y Drive output wave form to the Y Driver Boards >

Y Output Waveform

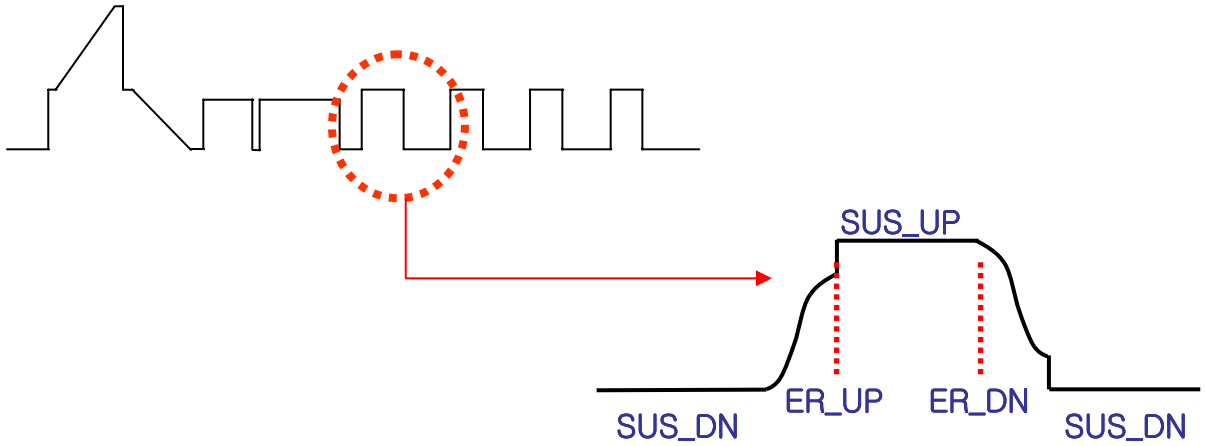


Y Sustain Board

Diagram of Y Sustain Board


Power Supply Board - SMPS
Z SUS Board
Distributes 5v VA VS
Receive 5V,Va, Vs from SMPS
Distributes 5v
Control Board
Distributes 5v VA
Logic signals needed to generate drive waveform
IPM generates Sustain Waveform
Generates Vsc, -Vy from 5v VA Vs by transformer.
Bottom Left X Board
FETs amplify Sustain Waveform
Transfer Waveform to Y Drive Board
Display Panel

IPM (Intelligent Power Module)



There are two IPMs used in 50PC1DR on the Y Sustain Board.

1. **SUS IPM (IC202)**
2. **ER IPM (IC201)**

Role of IPMs

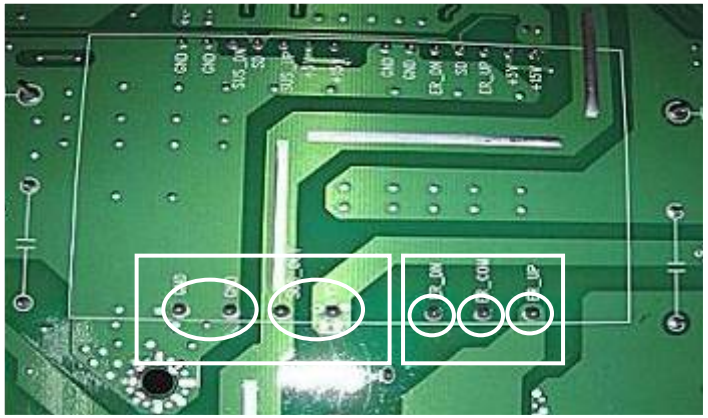
1. Generate Sustain Waveform (square wave) – SUS IPM.

2. Energy Recovery Function (for saving power) – ER IPM.

How to check IPM

(Resistance 'Diode Check', board removed from set)

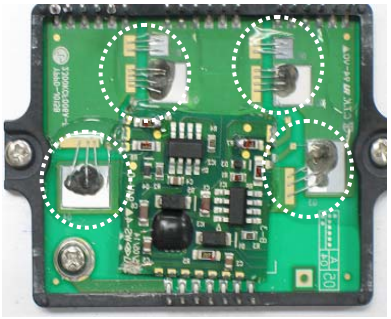
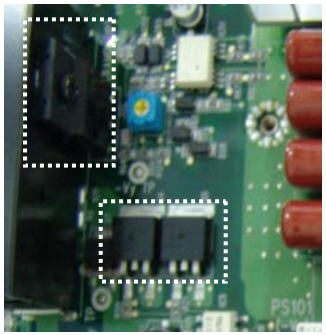
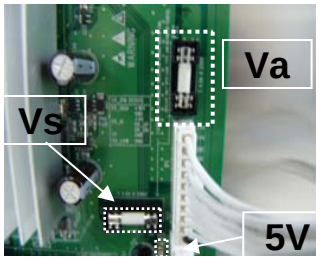
Forward Test : 1. GND (+), Sus-out (-)
2. Sus-out (+), Vs (-)
3. ER-DN (-), GRND (+)
4. GRND (+), ER-UP (-)
5. 18v (-), ER GRND (+)
6. 5v (-), ER GRND (+)

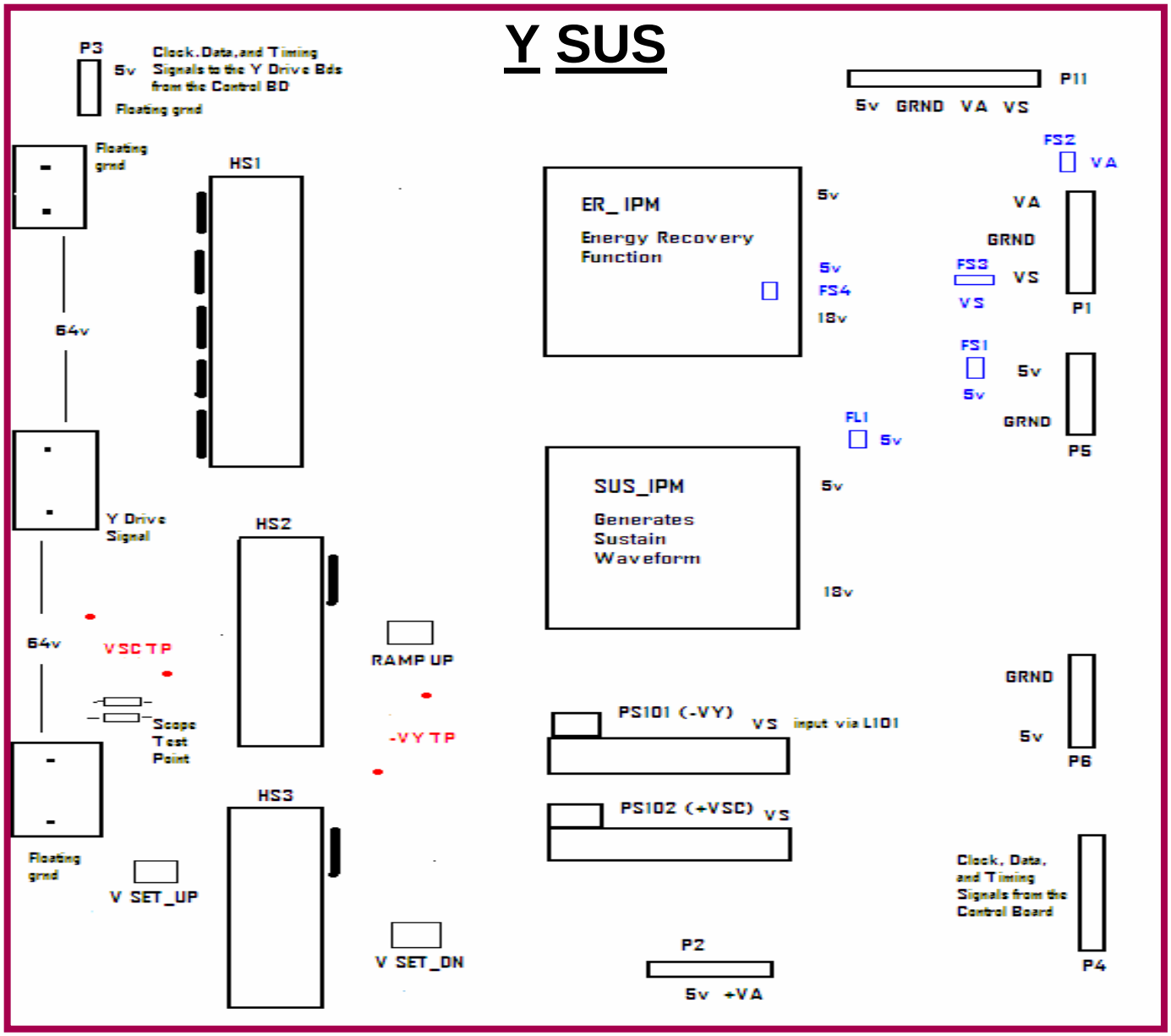


Reverse Test : 1. GND (-), Sus-out (+)
2. Sus-out (-), Vs (+)
3. ER-DN (+), GRND (-) 1.4
4. GRND (-), ER-UP (+) 1.4
5. 18v (+), GRND (-) 1.9
6. 5v (+), GRND (-) .9

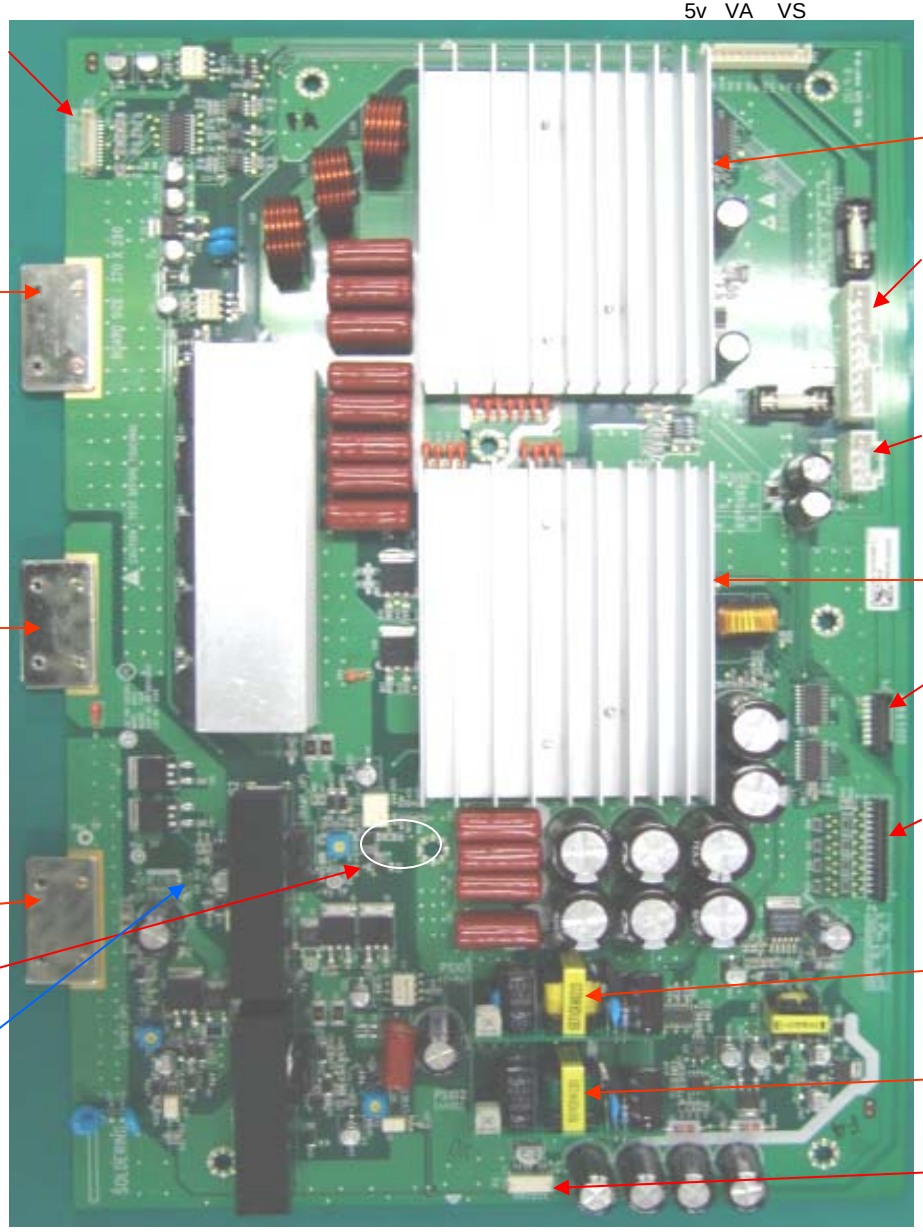
Note: ER_HIGH ER_LOW, to ER_IO OPEN in Diode Check

▶ Major defect : IPM fail, FET fail, fuse

Defect name	Description of defect	Part	Defect display
IPM Fail	No display (If the ER IPM failed, The screen can display normal picture for few minutes) (If SUS IPM failed, top portion of Drive Waveform will be missing)		 < No display >
FET Fail	No display (loss of Drive Waveform - Power FETs on Y Sustain Board)		
Fuse	No display * 5V- SMT fuse * Va, Vs fuse-ceramic fuse		


Y SUS
P3
5v
Clock, Data, and Timing Signals to the Y Drive Bds from the Control BD
Floating grnd
Floating grnd
HS1
64v
Y Drive Signal
HS2
64v
VSC TP
Scope Test Point
RAMP UP
-VY TP
HS3
Floating grnd
V SET_UP
V SET_DN
P2
5v +VA
P11
5v GRND VA VS
FS2
VA
ER_ IPM
Energy Recovery Function
5v
5v
FS4
18v
VA
GRND
FS3
VS
VS
P1
FS1
5v
5v
GRND
P5
FL1
5v
SUS_IPM
Generates Sustain Waveform
5v
18v
GRND
5v
P6
PS101 (-VY)
VS input via L101
PS102 (+VSC)
VS
Clock, Data, and Timing Signals from the Control Board
P4

Y SUSTAIN



P11 to Z SUS Board
5v VA VS

P3
5v
floating ground
Supplies Logic signals to Y Drive Boards to sequentially scan the Horizontal Grid

floating ground

64v

Y SUS output

64v

floating ground

18v_IPM
Measured at R61

Oscilloscope Waveform adjust test point

ER_IPM (IC201)

P1
VA
Ground
VS

P5
5v
Ground

VA, VS, and 5v all supplied from SMPS

SUS_IPM (IC202)

P6
Ground
5v to the Control Board

P4
Logic signals input from the Control Board to Y SUS

PS101 -VY
Transformer coupled

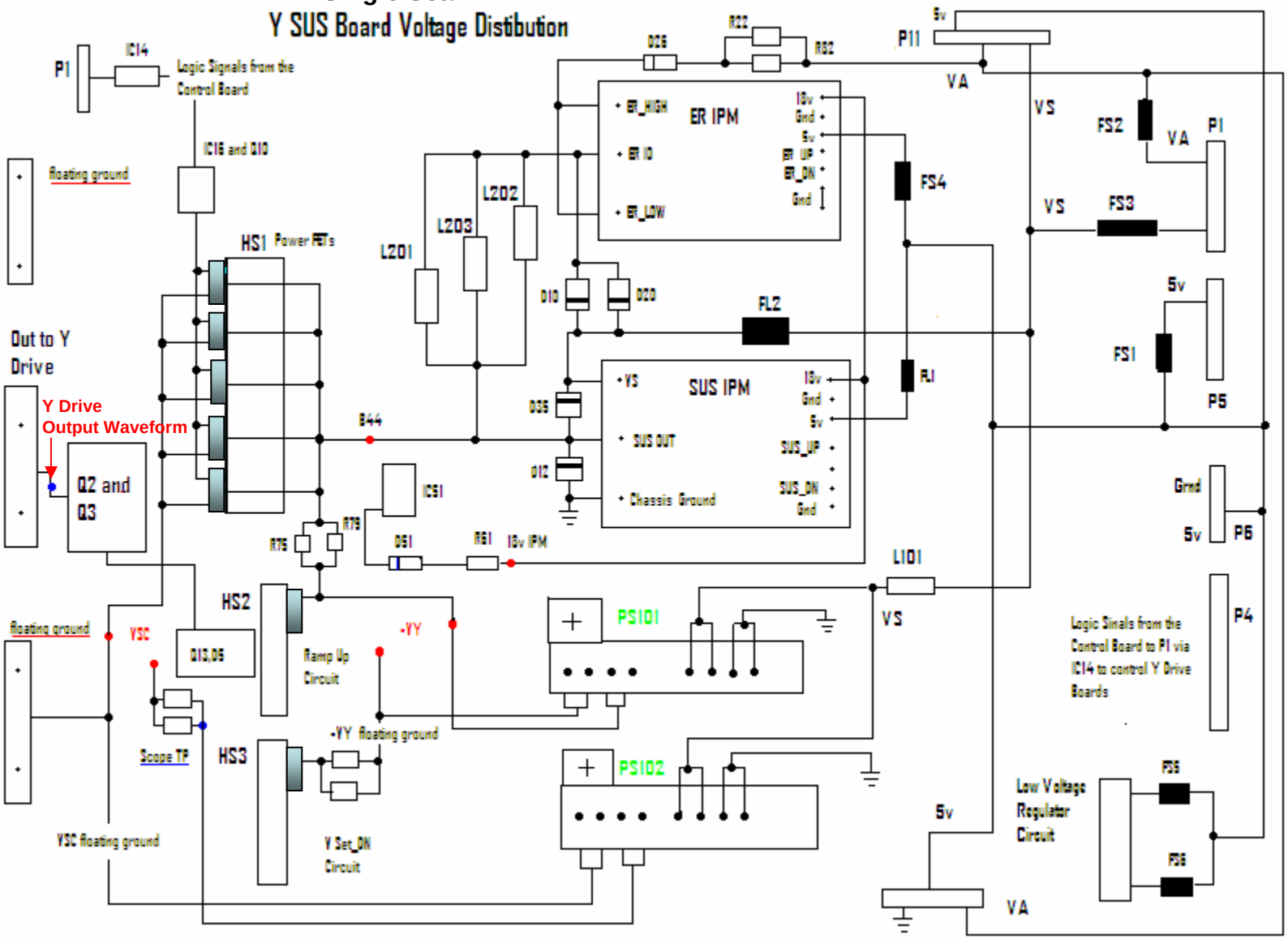
PS102 VSC
Transformer coupled

5v and VA to X Drive Board

P2

Single Scan

Y SUS Board Voltage Distibution



Resistance Measurements performed with board installed and no power applied -
(all resistance measurements are approximations)

- VA 3 Meg measured from chassis ground
- VS 18 Meg measured from chassis ground
- 5v 2K measured from chassis ground
- VSC Measure in Diode Mode at VSC TP
- -VY Measure in Diode Mode at -VY TP
- Floating Ground to Y Drive input measure in Diode Mode

Y SUSTAIN Board removed from PDP Assembly

(all resistance measurements are approximations)

VS to SUS OUT	1 Meg
SUS OUT to Chassis Ground	1 Meg
SUS_UP(+) SUS_DN(-)	450K
ER_LO to ER10	1 Meg
ER_HIGH to ER10	1 Meg
18v to Chassis Ground	6K
5v to Chassis Ground	2 Meg
ER_UP to Chassis Ground	10K
ER_DN to Chassis Ground	10K
SUS_UP to Chassis Ground	700K
SUS_DN to Chassis Ground	700K
Y SUS out at B1 to Floating Ground	2 Meg (infinite in Diode Mode)
VSC Test Points	Measure in Diode Mode
-VY Test Points	Measure in Diode Mode
ER_UP to ER_DN	20K

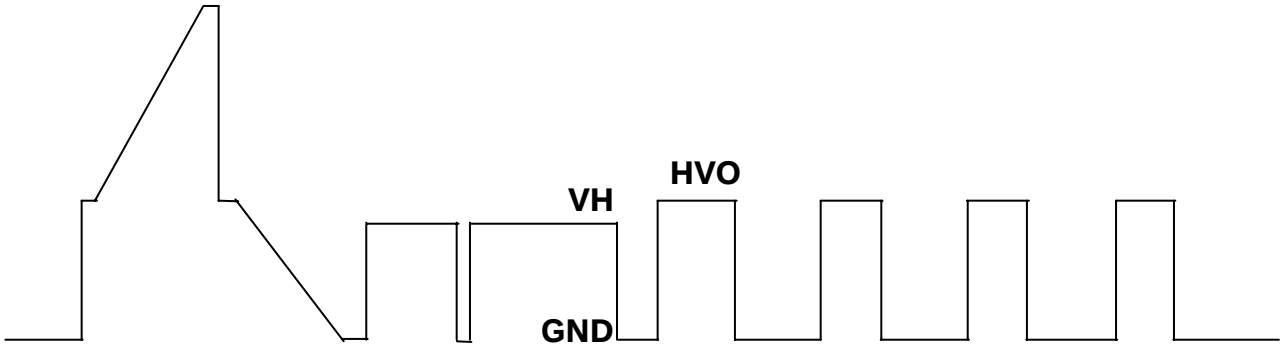
Y DRIVE BOARD Troubleshooting

Y DRIVE Boards

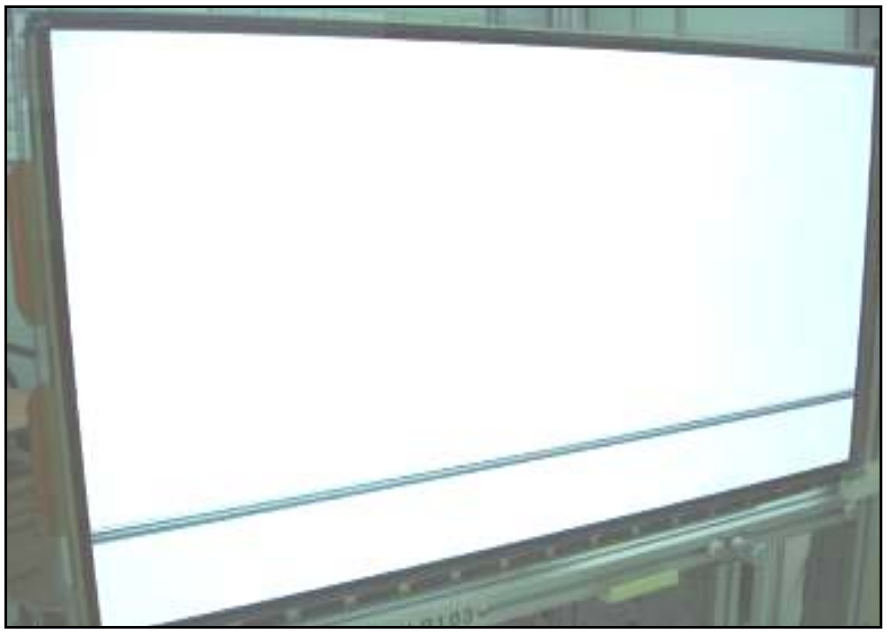
Y-Drive Board works as a path supplying Sustain waveform and Reset waveform which is made in Y SUSTAIN B/D to the Panel through SCAN DRIVER IC

Supplies a waveform which selects horizontal electrode sequentially.

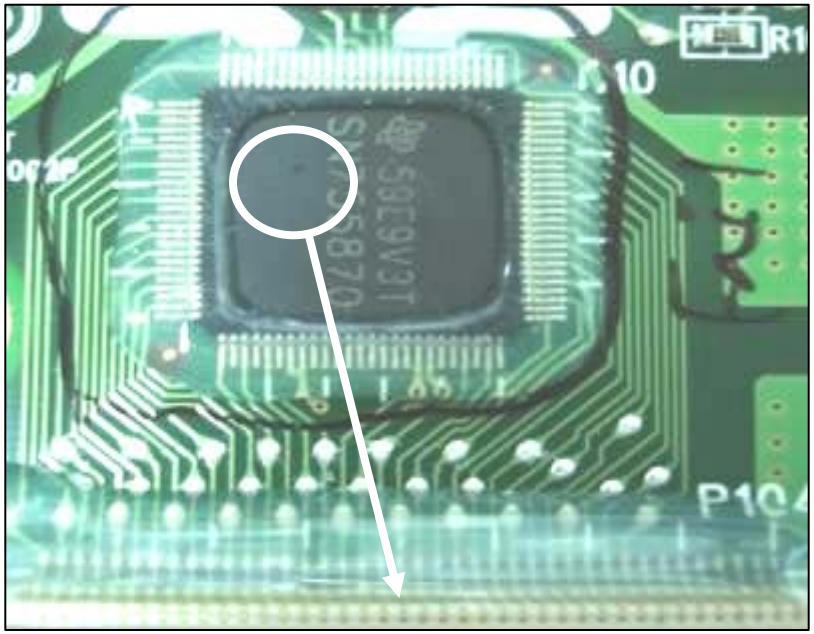
*** 50PC1DR uses 12 DRIVER ICs (TOP, BOTTOM: 6 each)**



Module check point



Defect Condition



Visual check of YDT-BTM

Horizontal bar displays across the screen due to no Scan Pulse caused by Scan IC Failure.

Failures can be found, sometimes by a visual inspection of the Y DRIVE Board scan IC's .

Defect : Horizontal Bar or Shutdown

Z SUSTAIN Board Troubleshooting

This Section of the Presentation will cover troubleshooting the Z-SUS Board Assembly. Upon completion of this section the Technician will have a better understanding of the circuit and be able to locate voltage and resistance test points needed for troubleshooting and alignment.

- DC Voltage and Waveform Test Points
- Z BIAS Alignment
- Resistance Test Points

Operating Voltages

Y SUS Supplied	VA 60v.
	VS 196v.
	5v.
Developed on Z SUS	Z Bias 90v
	SUS_IPM
	ER_IPM
	IPM 18v

Input Voltages from the Y SUS Board

VS — Supplied to IC7 the SUS_IPM through coil FL152 and to the Primary Winding of Transformer T2 of the Z Bias Circuit. Input measured from P151 pin 12 to chassis ground.

VA — Supplied to the ER_IPM through parallel resistors R91 and R9 and through Diode D84. The VA voltage is also routed to connectors P152 and P153 at pin 7 of each connector. Used to supply 60v to the Center and Bottom Right X Boards. Input measured from pins 8 and 9 of P151 to chassis ground.

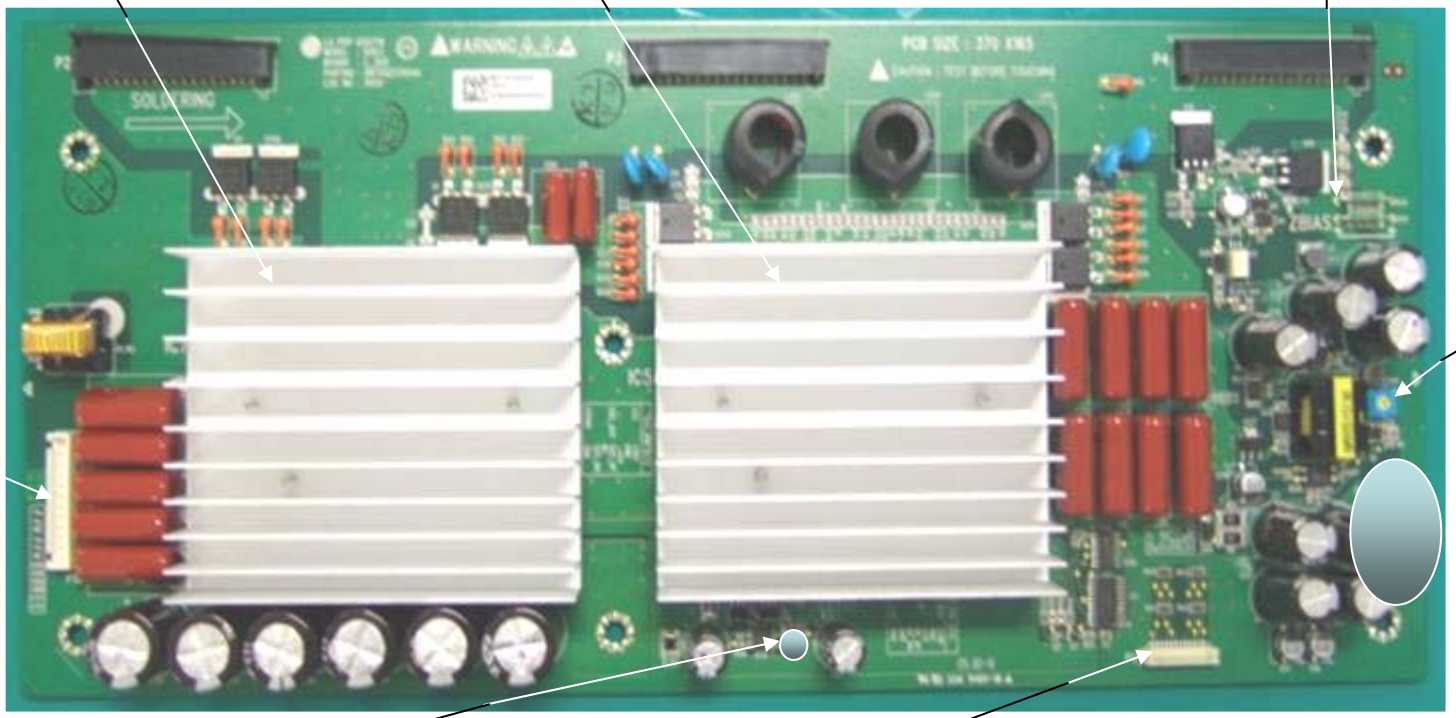
5v — Used to Bias the circuits on the Z SUS Board and through P152 and P153 pins 3 and 4 supplies 5v to bias the Center and Right X Boards. Input measured from P151 pins 1 and 2 to chassis

Voltages Developed on the Z SUS Board

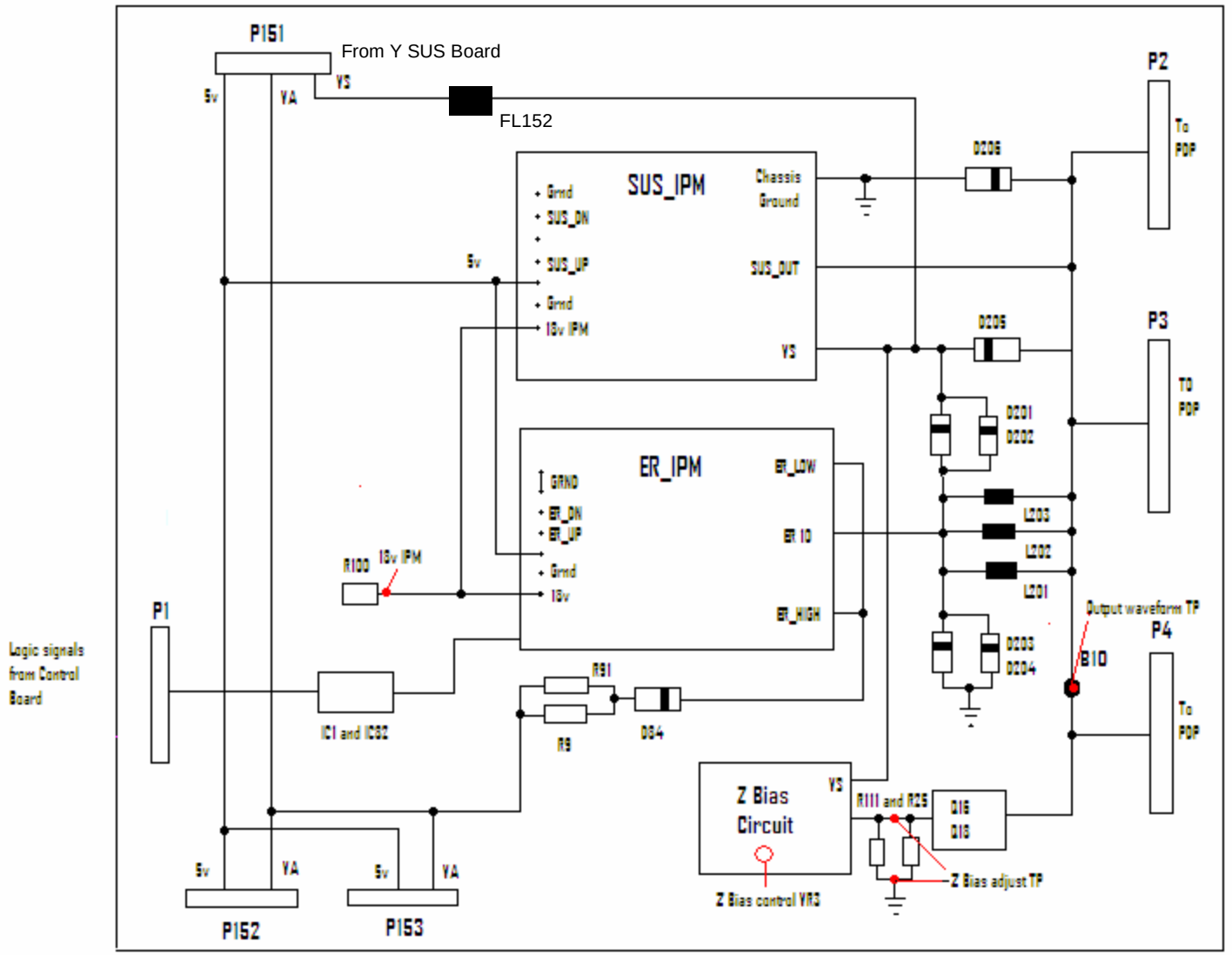
Z Bias — 90v used to Bias the output circuits that drive the Sustain and Erase pulses for the PDP. Measured across parallel resistors R25 and R111, adjusted at VR3.

IPM 18v — Needed to generate the Sustain and Erase pulses in the IPMs. Measured at right side of resistor R100 (above capacitor C27).

Z SUSTAIN Board



Z SUSTAIN Voltage Distribution



To X Drive Boards

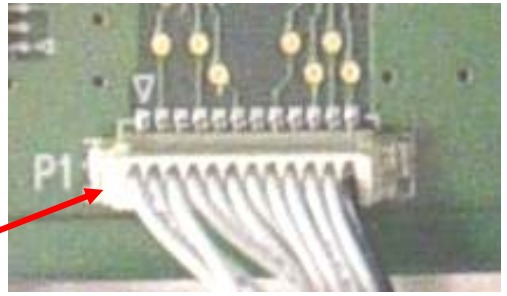
Waveforms Z SUSTAIN Board

- Input signals to the Z SUS Board at P1 from the Control Board are routed through IC1 and IC82 to the IPM. These signals are used to develop the Z SUS Drive Waveform to drive the PDP.

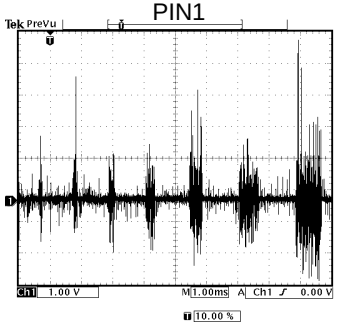
Z Board SUS Board

Waveform inputs from the Control Board

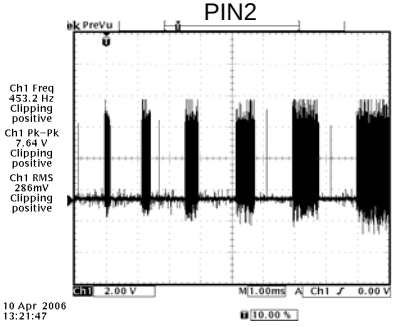
NOTE: These voltages will vary due to changes in design and variations in the PDP panel.



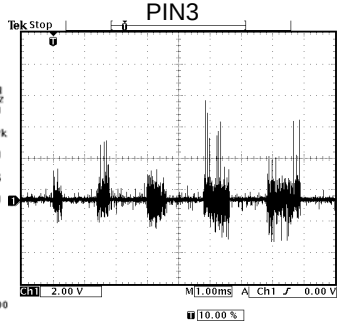
PIN1


Tek PreVu
Ch1 Freq 453.2 Hz Clipping positive
Ch1 Pk-Pk 7.64 V Clipping positive
Ch1 RMS 286mV Clipping positive
10 Apr 2006 13:21:47

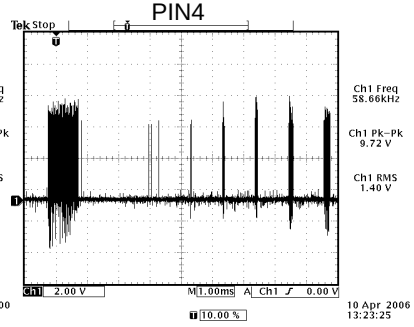
PIN2


Tek PreVu
Ch1 Freq 1.205kHz Clipping positive
Ch1 Pk-Pk 8.62 V Clipping positive
Ch1 RMS 1.61 V Clipping positive
10 Apr 200 13:22:17

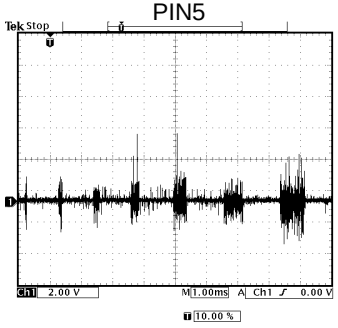
PIN3



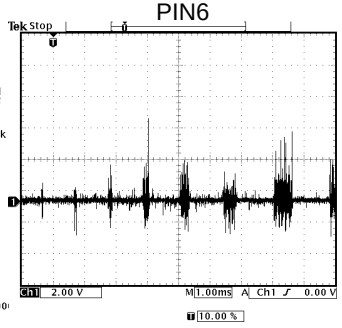
PIN4



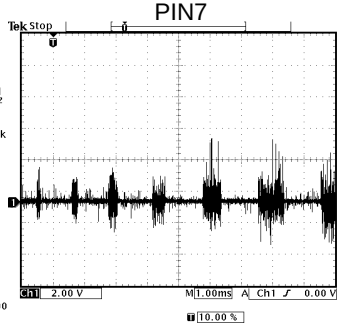
PIN5



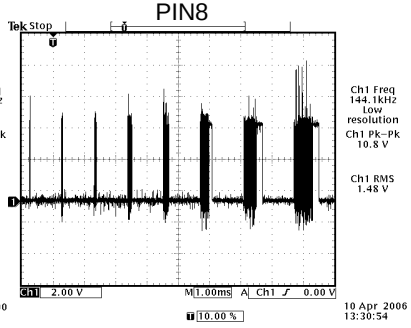
PIN6



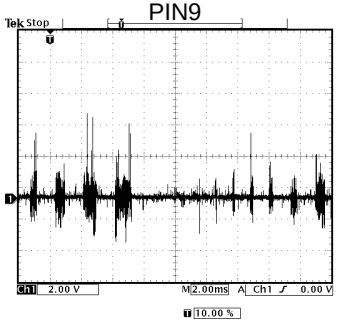
PIN7



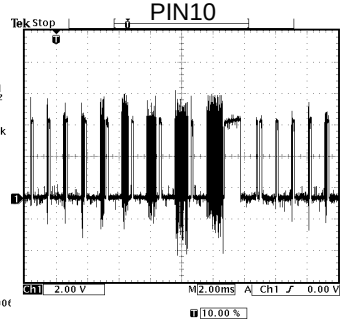
PIN8



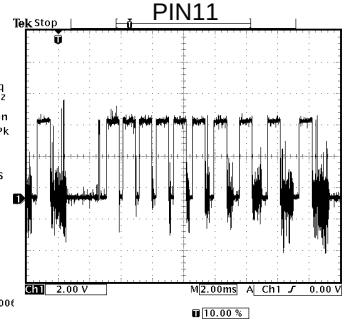
PIN9



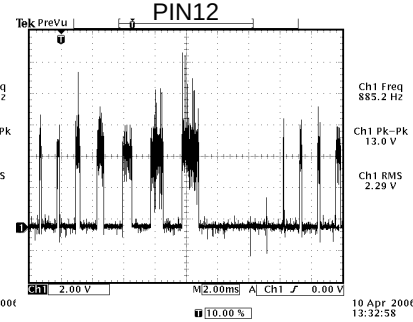
PIN10



PIN11



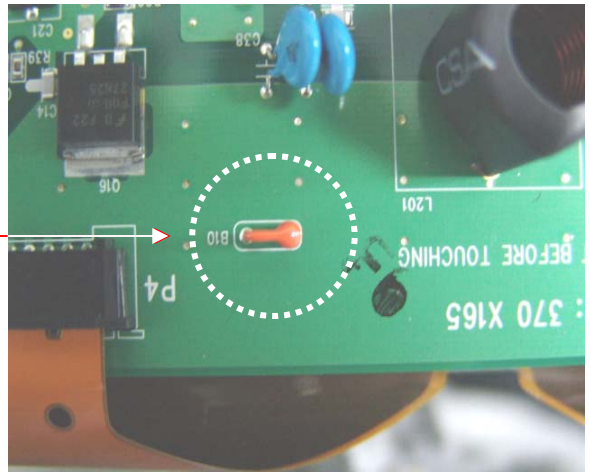
PIN12



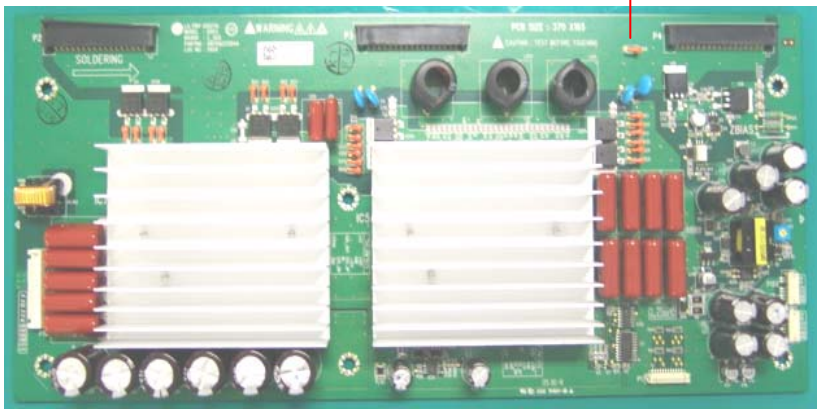
Z SUSTAIN Board

Provides the SUSTAIN PULSE and ERASE PULSE for generating SUSTAIN discharge in the panel by receiving LOGIC signals from the CONTROL B/D.

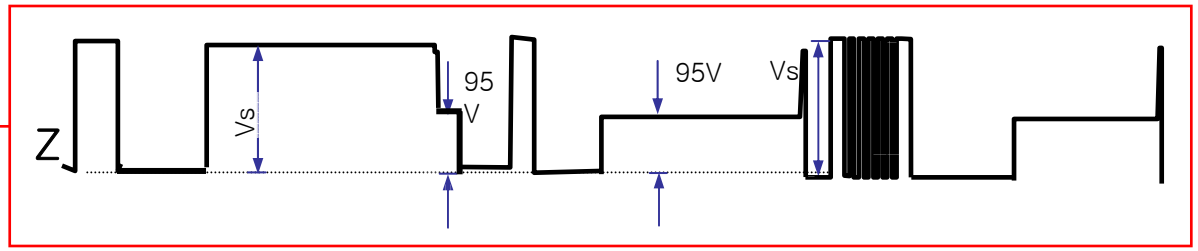
This waveform is supplied to the panel through FPC(Z).



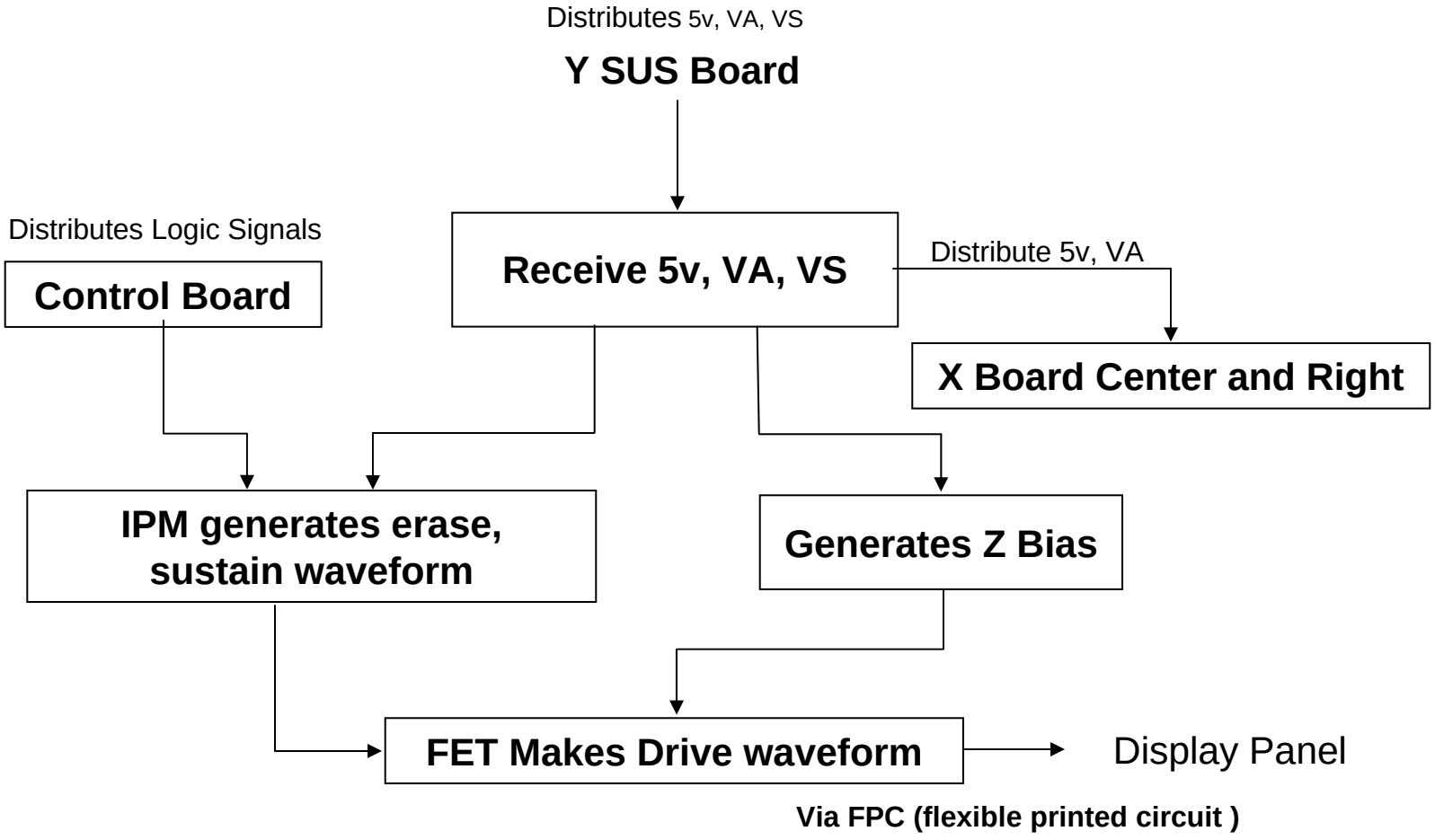
< Probe connect point to Oscilloscope to check Z wave form >



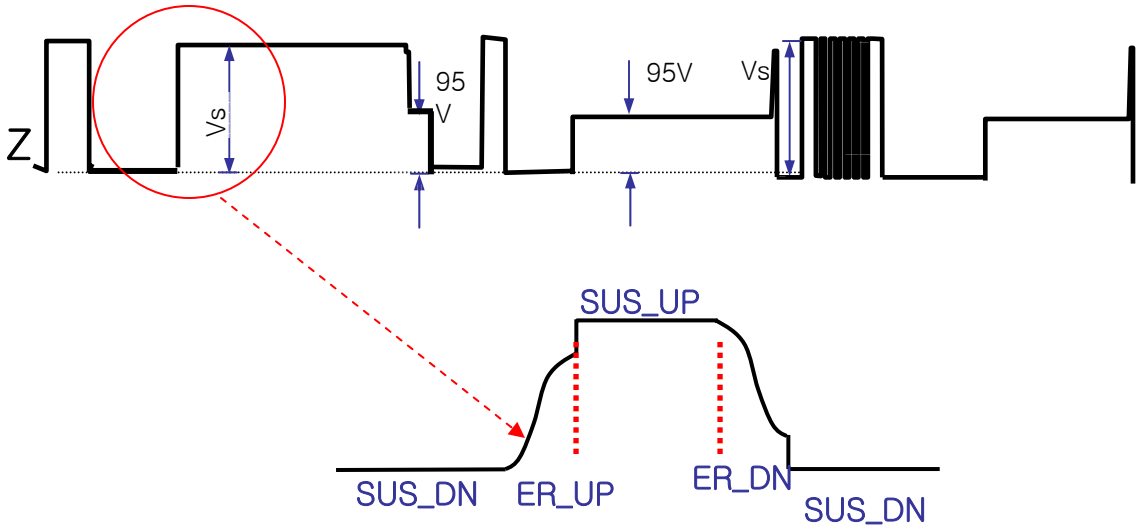
Z DRIVE Waveform



Z SUSTAIN BOARD



Z SUS IPM (Intelligent Power Module)



There are Two IPM (Intelligent Power Module) on the Z sustain board of the 50PC1DR.

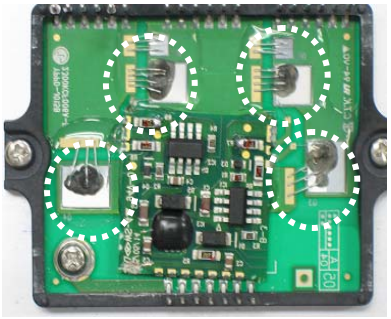
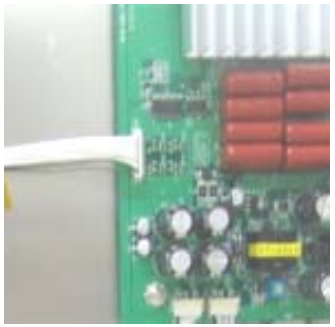
One is SUS IPM (IC7) , another is ER IPM (IC5)

Role of IPM

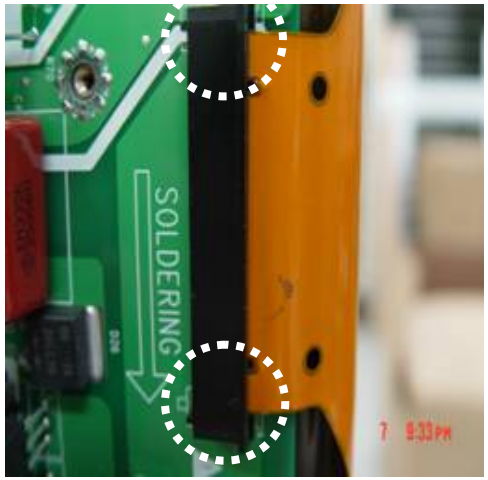
1.Generate sustain and erase waveform(square wave) – SUS IPM.

2.Energy recovery function (for saving power) – ER IPM.

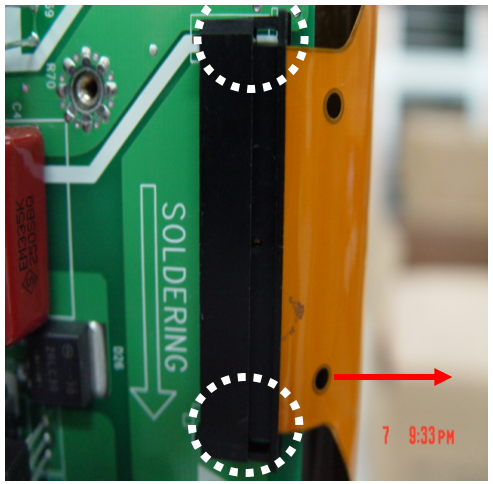
▶ **Major defect : IPM fail, cable connection.**

Defect name	Description of defect	Part	Defect display
IPM Fail	Dark display		< Dark display >
P1 Cable connection	If the cable was not connected, There is no display		< No display >

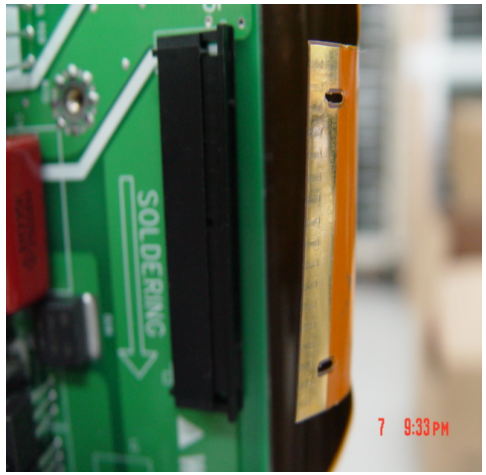
FPC (Flexible Printed Circuit) Removal for Z Board Replacement



Pull out Lock as shown in circles



Pull Lock apart to remove



Pull FPC Connector as shown in arrow.

Resistance Measurements

- VS Started at 340 meg settled approx 1 meg
- VA 1.3 meg
- 5v 1 meg
- B10 to Chassis Ground 2 meg
- Chassis Ground to SUS_OUT 2 meg
- SUS_OUT to VS 1 meg
- ER low to ER 10 1 meg
- ER 10 to ER High 1 meg
- 18v to Chassis Ground 6K
- SUS_UP to Chassis Ground 700K
- SUS_DN to Chassis Ground 2meg
- ER_UP to Chassis Ground 10K
- ER_DN to Chassis Ground 10K

*Measurements made with the board disconnected

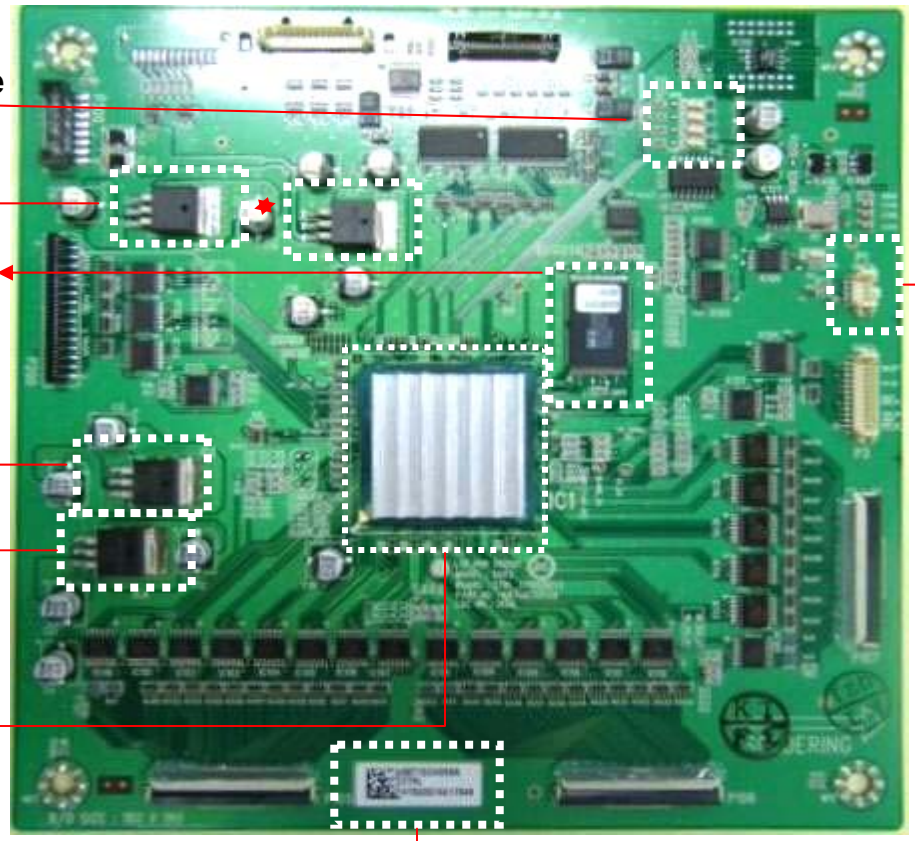
CONTROL Board Troubleshooting

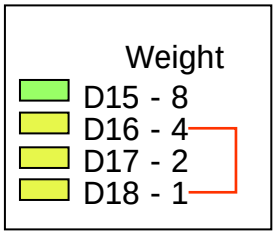
CONTROL Board

◆. In charge of all signal process and creating ON/OFF order of all FET on DRIVER B/D by receiving 8 bit R, G, B input.

◆. Power : 3.3V/5V

Temperature display diode can be checked.
Left picture shows 7 periods which means normal temperature
Green = OFF
Yellow = ON





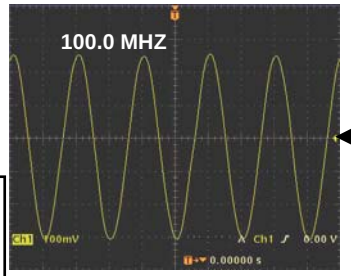
Control Board

1. Check LED (Normal status lighting or not)
2. CHECK OSC X1 output. (100MHZ)
3. Check CTRL input voltage

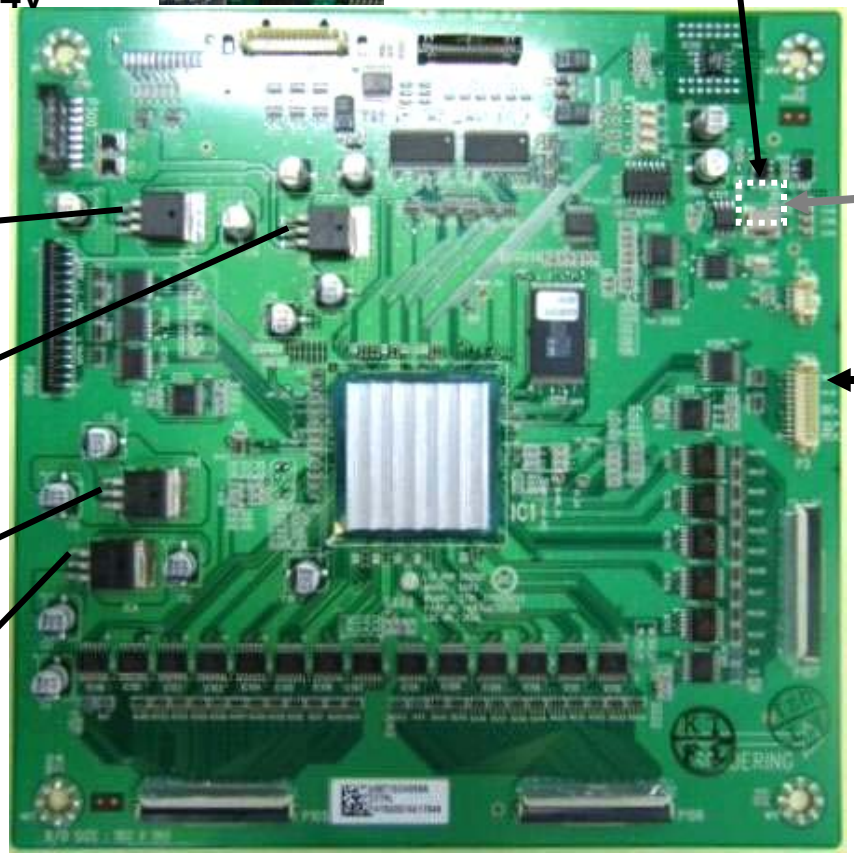
   (CONNECTOR P10)
4. CHECK each FET 3.3V, 5V,1.8V., 2.4V

OSC(X1)

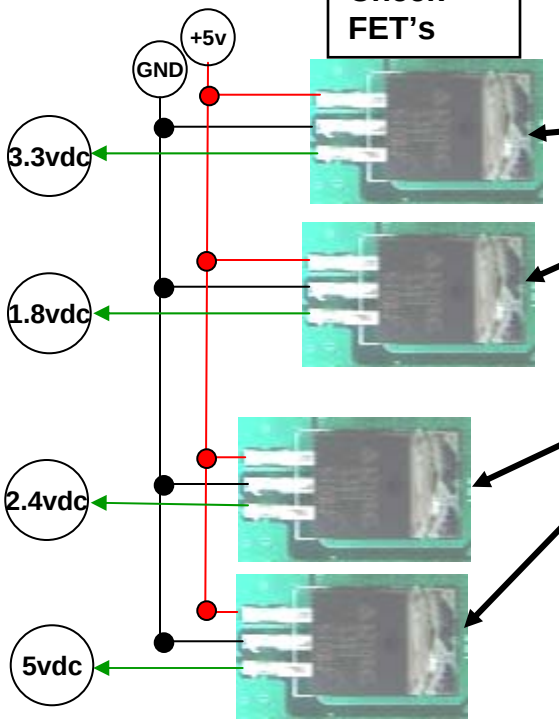
Check oscillator state. Be careful to avoid physical shock.



Check FET's



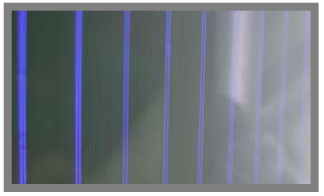
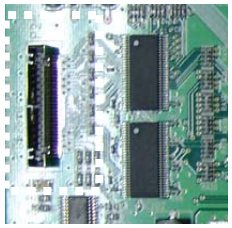
Probe Test point



Input voltage

Control Board

- Main Defect : MCM , connector, oscilator, LVDS poor connection
- Voltage used : 5V/3.3V/1.8V/2.5V (4 separate operating voltages).

Defect part	Description of defect	Part	Solution	Defect display
CONTROL IC	Regular vertical lines	< MCM >	Replace Control Board	 < Display Lines >
Connector	No display or Partly no display	< Connector >	Reseat Control Board Connectors	< Partly no display >
Oscilator	No picture	< Oscillator >	Replace Control Board	
LVDS poor connection	Remove LVDS Cable and short pins 1 and 2 of connector P1 to display test patterns. If patterns are not present, Control board is defective	 LVDS Connector	Reconnect LVDS or Replace Control Board	< Poor connection >

X Drive Board

Voltages Supplied to the X Boards

- VA From the Z SUS Board to both the Center
- and Right X Boards.
- VA From the Y SUS Board to the Left X Board
- 5v From the Z SUS Board to both the Center and
- Right X Boards.
- 5v From the Y SUS Board to the Left X Board.

The Control Board supplies the Video Signal to the TCP ICs. If there is a bar defect on the screen, it could be a Control Board problem.

Control Board to X Board Address Signal Flow

This will show Signal Flow Distribution to help determine the failed part depending on where the failure is on the screen.

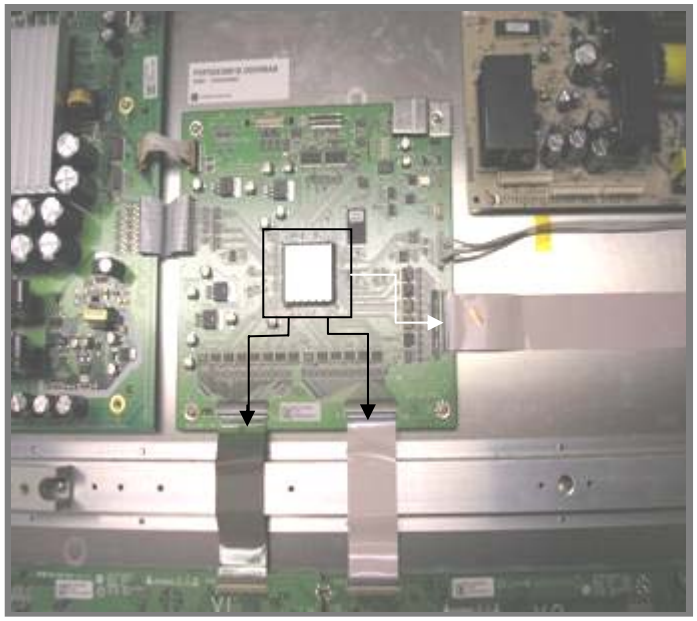
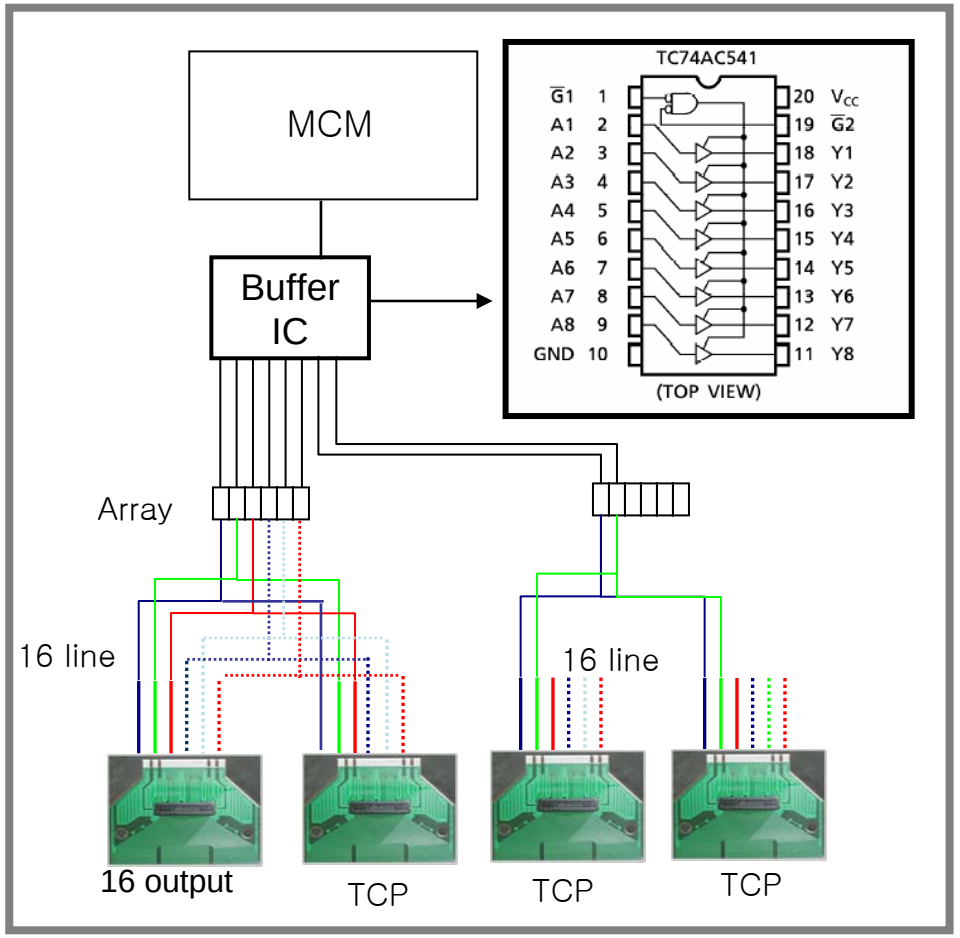
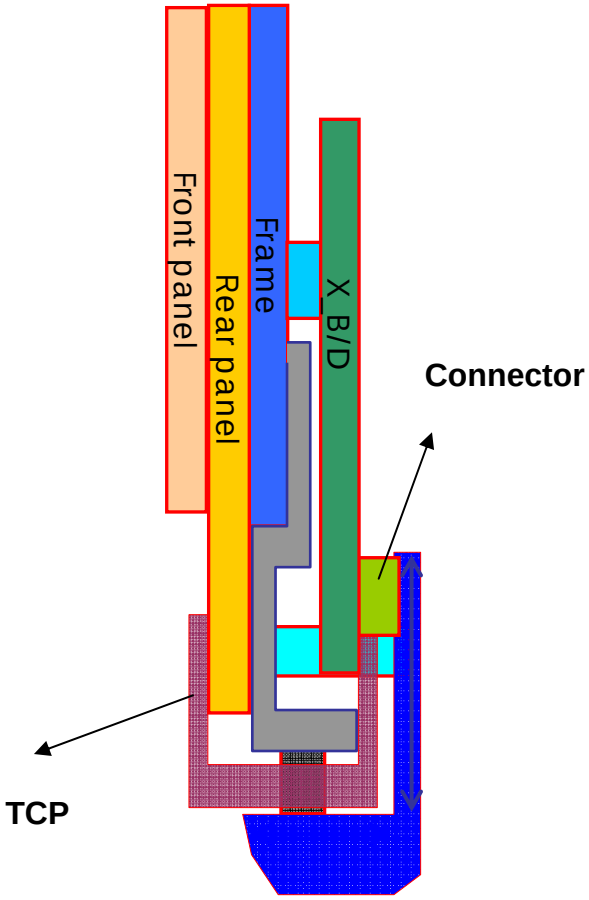


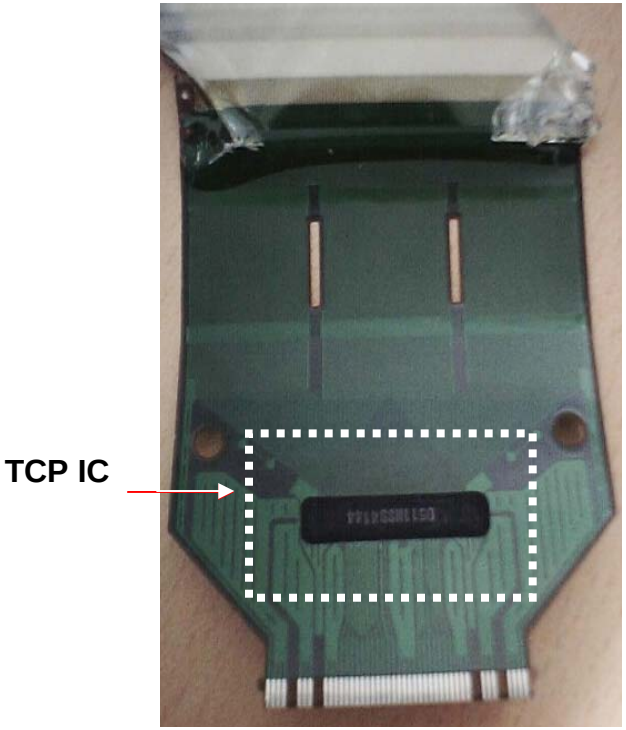
Diagram of Control Board



TCP (Tape Carrier Package)

: supplies RGB 6bit signal to the PDP by connecting the PAD Electrode of the PANEL with the X Board.



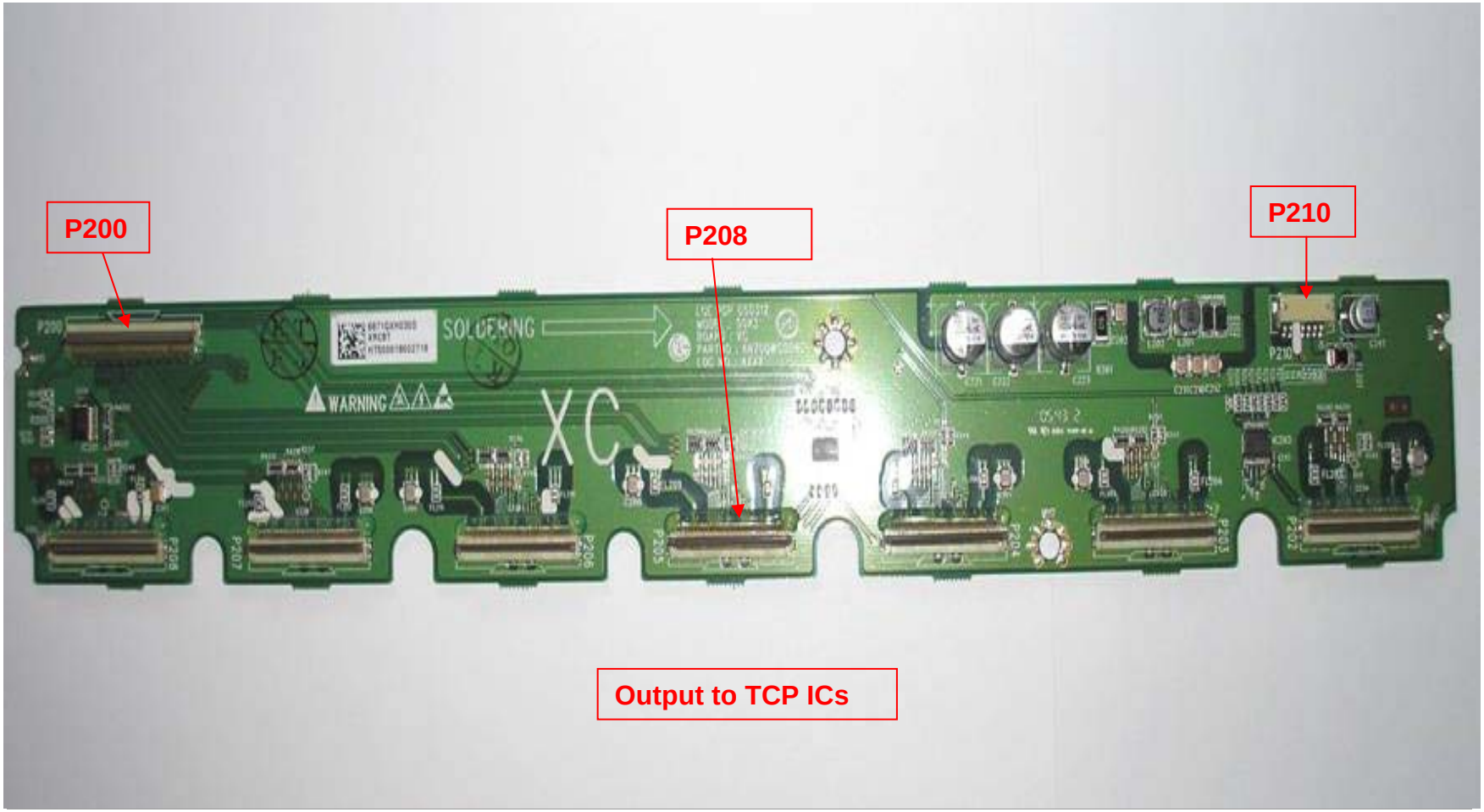


Front side

Behind side

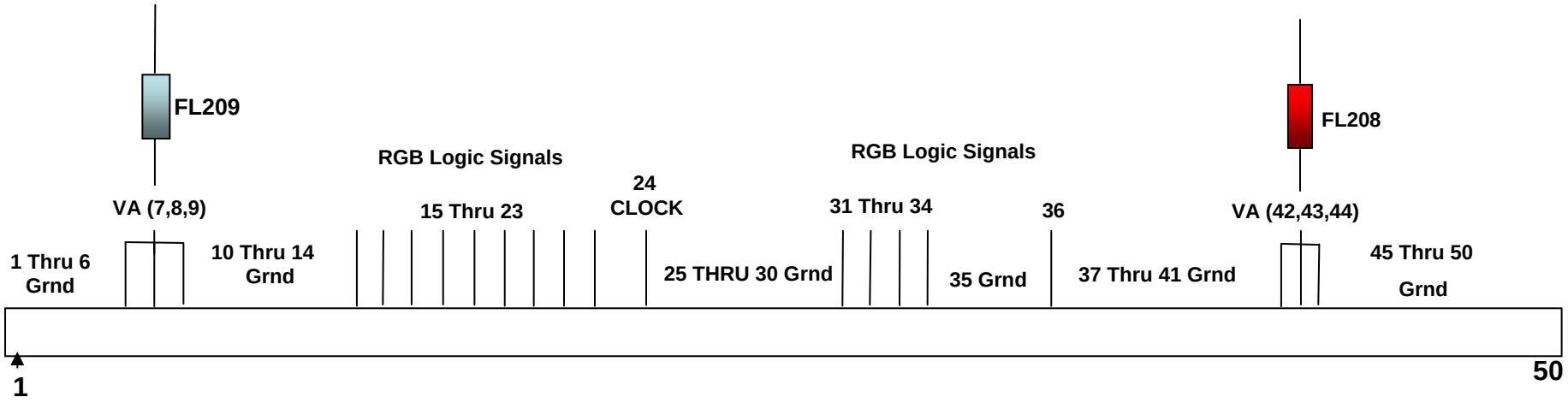
<IC Defect>

Center X Drive Board



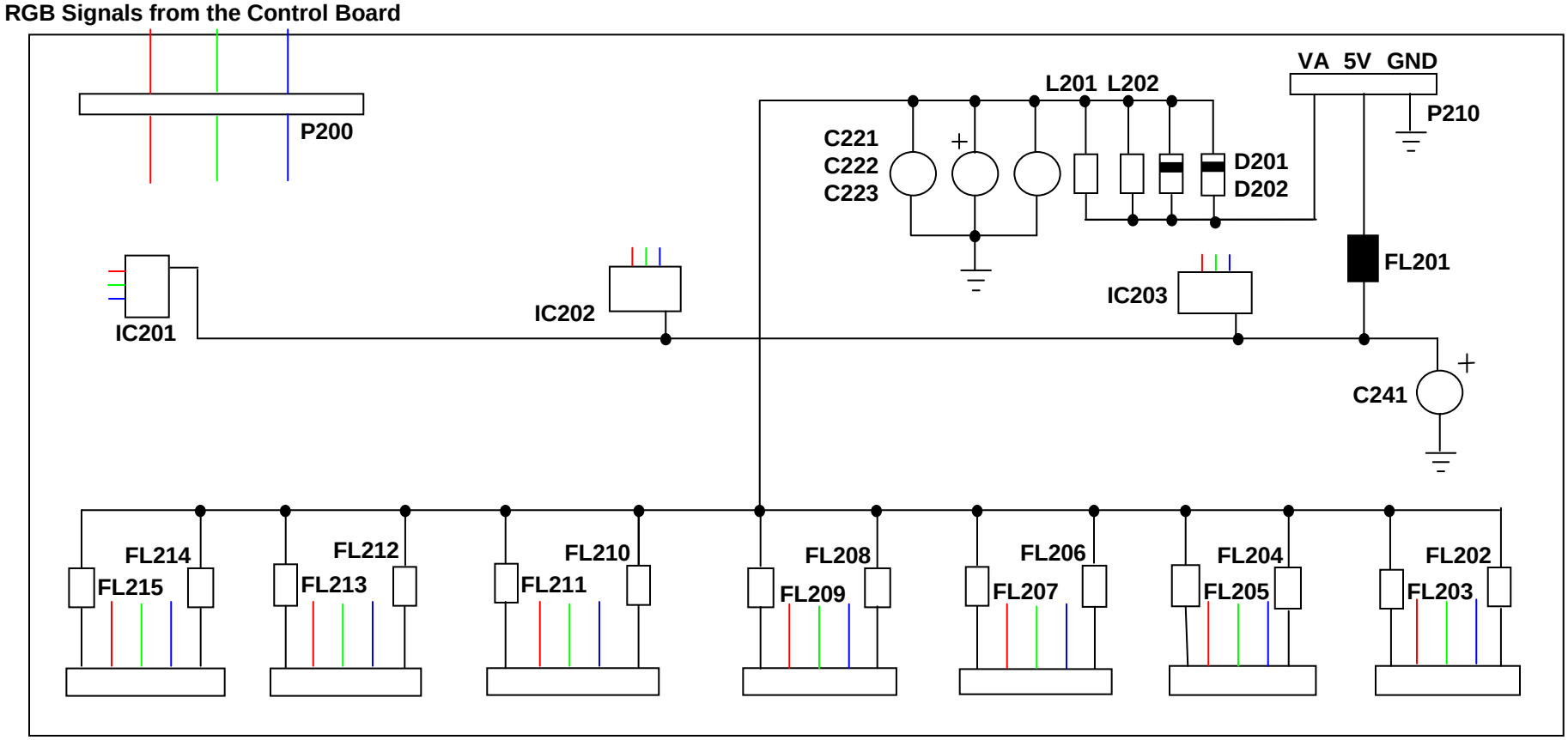
Center X Board

Connections on Connector P208



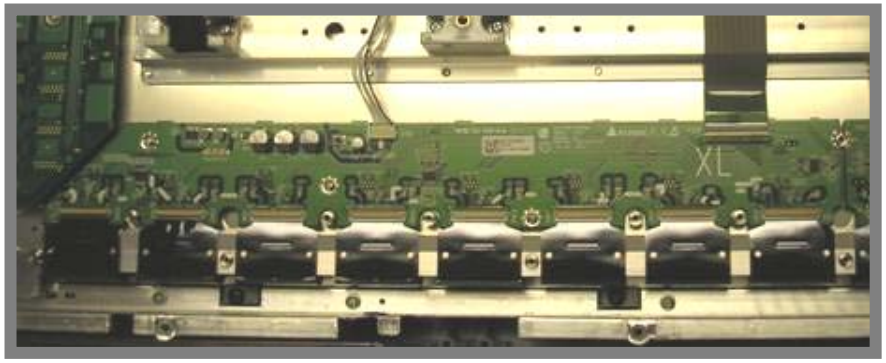
Output to TCP IC

X Board Voltage Distribution

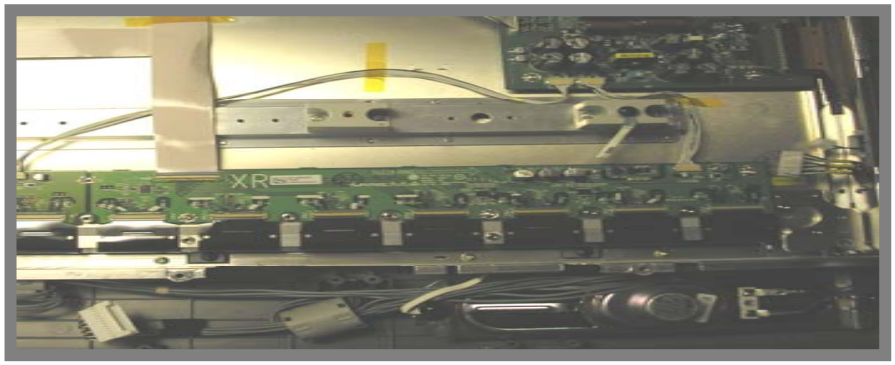


RGB Address Signals out to TCP IC's and PDP

The X Board receives a Logic Signal from the Control Board and controls the Address Pulse (generates Address Discharge) by an ON/OFF operation, and supplies the waveform to TCP (data).

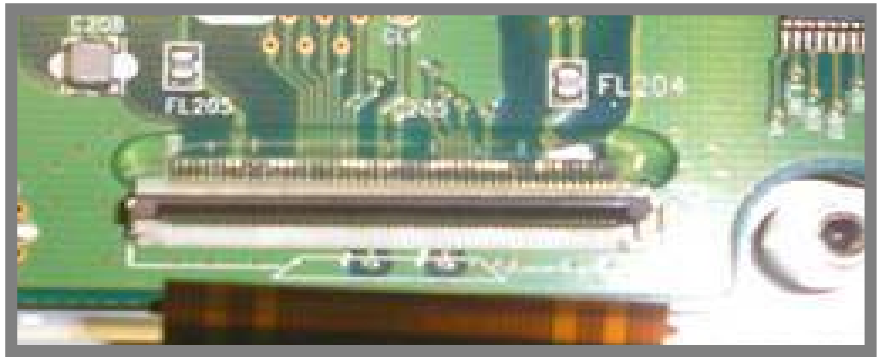


X LEFT B/D



X RIGHT B/D

COF Separating

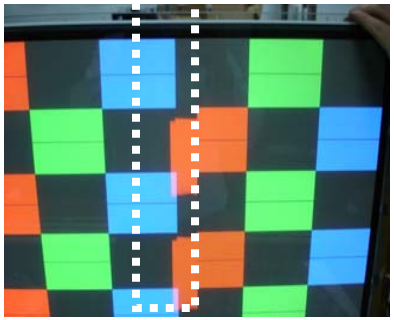
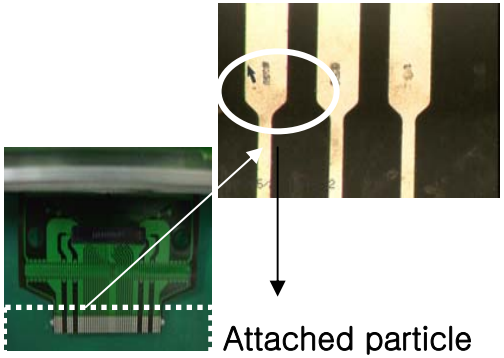
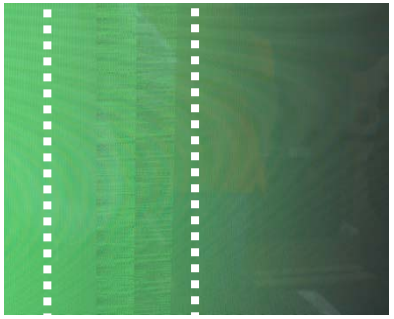


Lift up lock as shown in the Picture.

Remove TCP as shown in Picture

X board

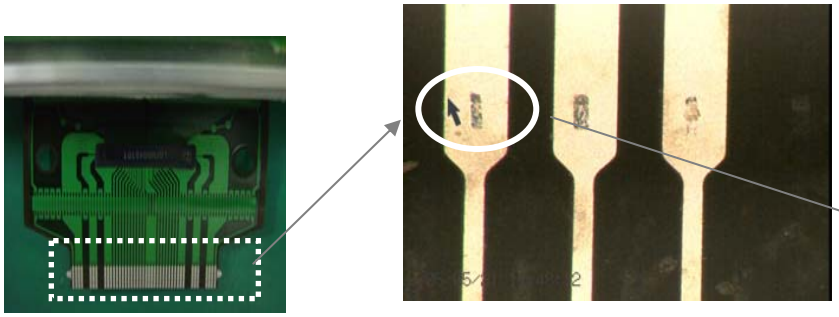
▶ **Major defect : Poor connection, Particle inserted.**

Defect name	Description of defect	Part	Defect display
Poor connection	Vertical abnormal display	< Poor connection >	
	Vertical abnormal display		
	Vertical line (similar with IC fail)	Check for attached particle or poor connection either one is possible.	

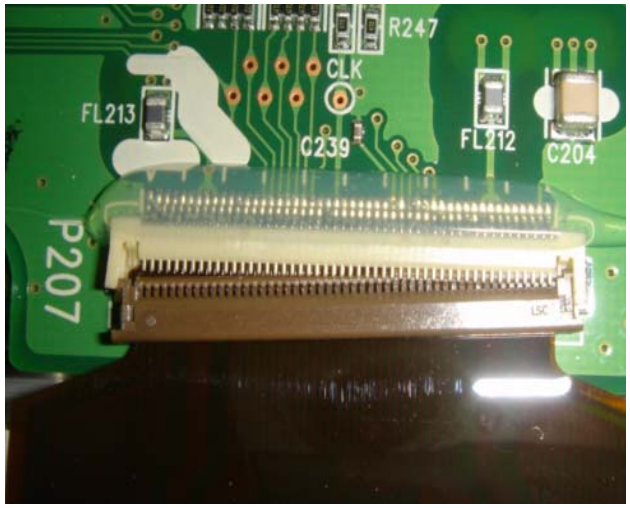
Vertical Line

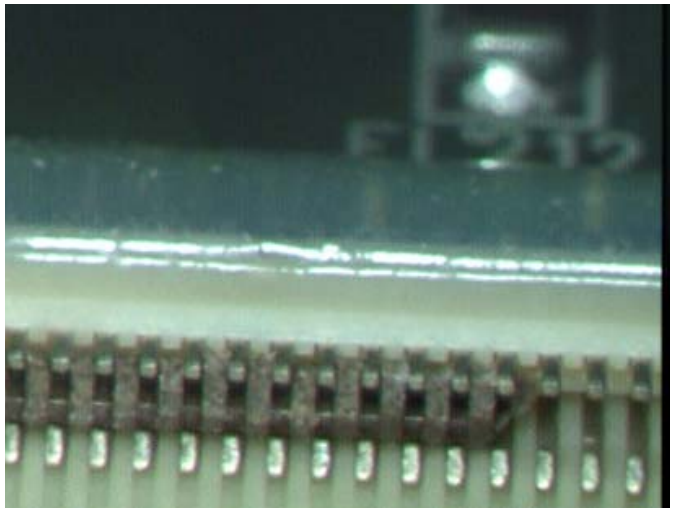
Disconnect TCP, Check for a possible particle, if found remove with compressed air or soft fabric.

If 1 vertical line can not be resolved by this, then the defect can not be repaired and the PDP will need to be replaced.

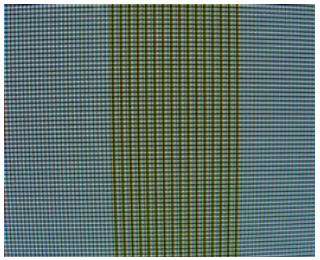


Make sure the Ribbon Cable is securely installed



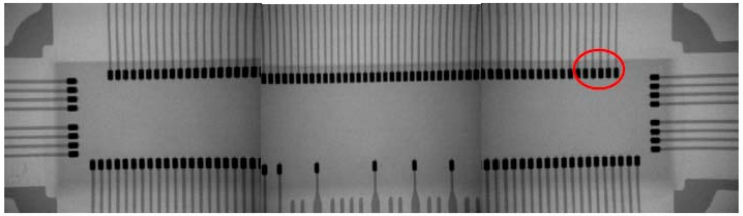


Control Board : If the buffer IC has failed, there can be vertical lines.

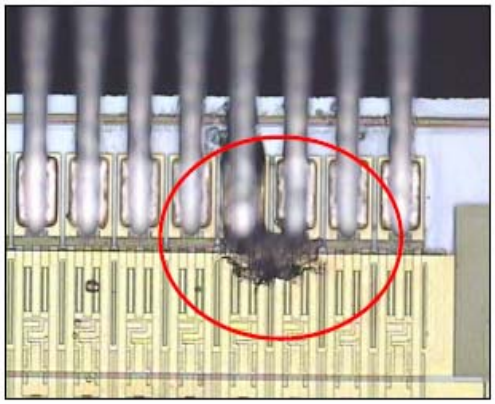


The defect can not be repaired if the vertical line is caused by TCP IC failure.

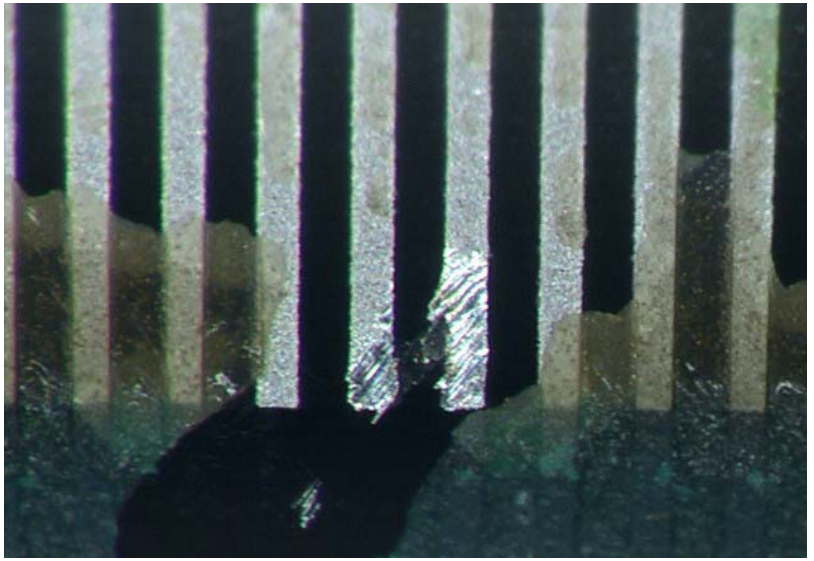
Root cause of TCP IC failure is ESD or Surge.



< Structure of TCP with X ray analyzer >



< Failure viewed with microscope >



< metal particle between the electrode >

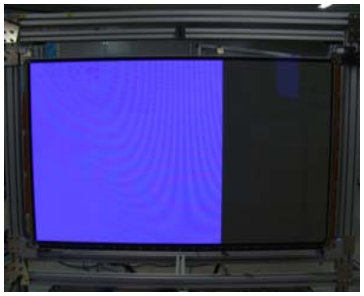
Cable description

This is total collection of cables in PDP circuit ,

Cable No.	Purpose
8 9 10	Supply Va,5V to X B/D
2 3 4	RGB Video signal
1	FET driving signal to make the Y waveform
5	5V,15V for IC and FET driving
13	5V supply
14 12	Va,Vs for Y and Z board
11	FET driving signal to make Z waveform
6	Supply waveform on panel for operation
7	Connecting between Y drive top and bottom

When each cable disconnected.

Cable No.	When disconnected
8 9 10	The section of the X board where the cable is disconnected will not show the screen.
2 3 4	The section of the X board where the cable is disconnected will not show the screen.
1	No display (no Y waveform)
5	No display (CTRL board will not be operated)
13	No display (no 5 V)
12 14	No display (no Va,Vs)
11	No display (no Z waveform)
6	No display (if the connection is poor, the display will be abnormal)
7	Bottom half of screen will not be displayed.



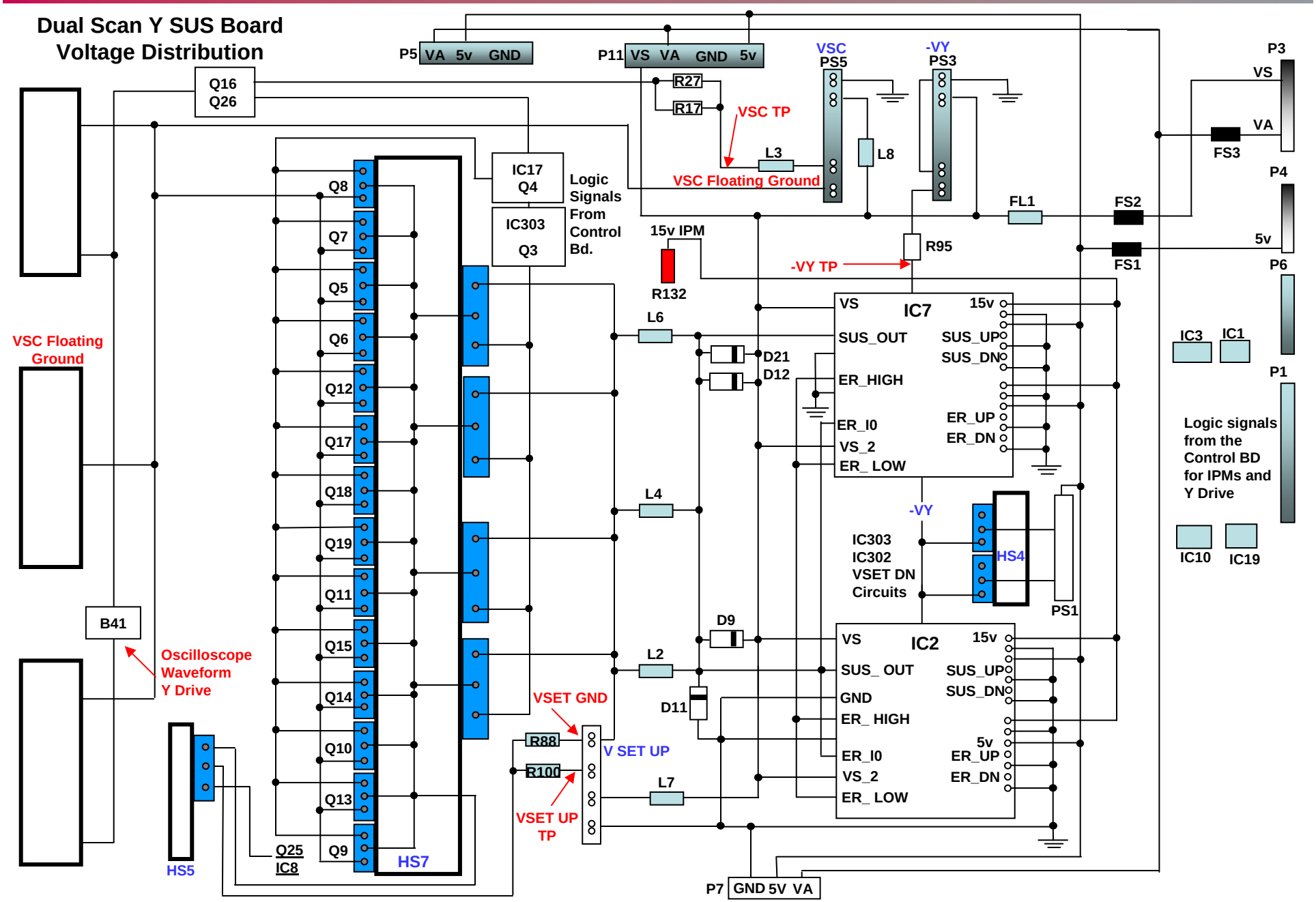
< ⑧ or② was disconnected >

< ⑥ was not connected well >

- well connected-

- Not connected -

< ⑦ was not connected >


Dual Scan Y SUS Board
Voltage Distribution
P5 VA 5v GND
P11 VS VA GND 5v
VSC PS5
-VY PS3
P3
VS
VA
FS3
P4
5v
P6
P1
R27
R17
VSC TP
L3
L8
VSC Floating Ground
FL1
FS2
FS1
Q16
Q26
IC17
Q4
IC303
Q3
Logic Signals From Control Bd.
15v IPM
R132
R95
-VY TP
VS
IC7
15v
SUS_OUT
SUS_UP
SUS_DN
ER_HIGH
ER_I0
ER_UP
ER_DN
VS_2
ER_ LOW
L6
D21
D12
L4
-VY
IC303
IC302
VSET DN
Circuits
HS4
PS1
IC3
IC1
IC10
IC19
Logic signals from the Control BD for IPMs and Y Drive
VSC Floating Ground
B41
Oscilloscope Waveform Y Drive
D9
L2
D11
VS
IC2
15v
SUS_ OUT
SUS_UP
SUS_DN
GND
ER_ HIGH
5v
ER_I0
ER_UP
ER_DN
VS_2
ER_ LOW
VSET GND
R88
R100
V SET UP
L7
VSET UP TP
Q8
Q7
Q5
Q6
Q12
Q17
Q18
Q19
Q11
Q15
Q14
Q10
Q13
Q9
Q25
IC8
HS5
HS7
P7 GND 5V VA

How to check IPM (Dual Scan)

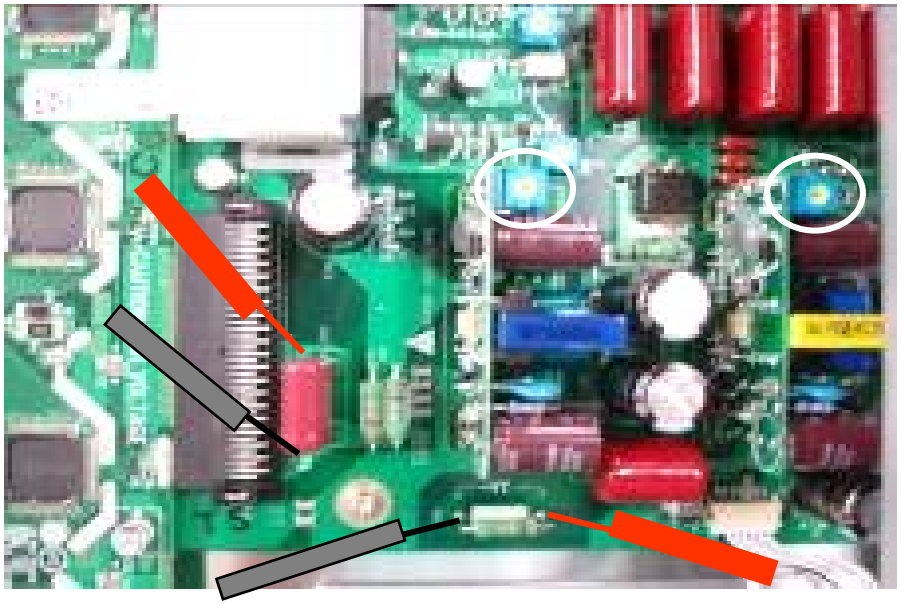
(Resistance 'Diode Check', board removed from set)
For both IC2 and IC7

Forward Test : 1. +VS (-), SUS_OUT (+)
2. SUS_OUT (-), CH GND (+)
3. CH GND (+), ER_HIGH(-)
4. +15 (-), CH GND (+)
5. +5 (-), CH GND (+)
6. SUS_UP (-), CH GND (+)
7. SUS_DN (-), CH GND (+)
8. ER_UP (-), CH GND (+)
9. ER_DN (-), CH GND (+)

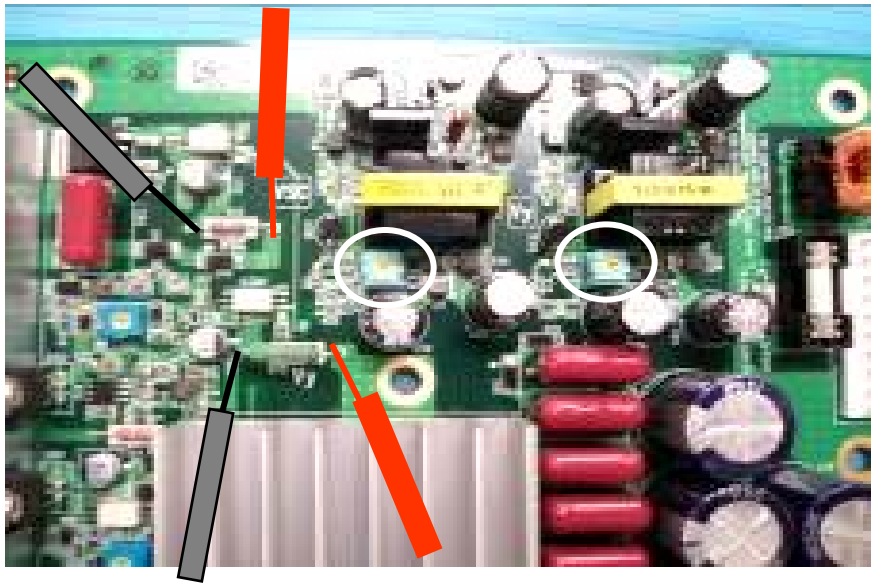
Reverse Test: 1. +VS (+), SUS_OUT (-)
2. SUS_OUT (+), CH GND (-)
3. CH GND (+), ER_HIGH (+)
4. +15 (+), CH GND (-) 3.03
5. +5 (+), CH GND (-) .96
6. SUS_UP (+), CH GND (-) 1.42
7. SUS_ DN (+), CH GND (-) 1.42

Note: ER_HIGH to ER_IO (OPEN)
SUS_OUT to ER_IO (SHORT)

Y SUSTAIN Board VSC / -Vy Measurement

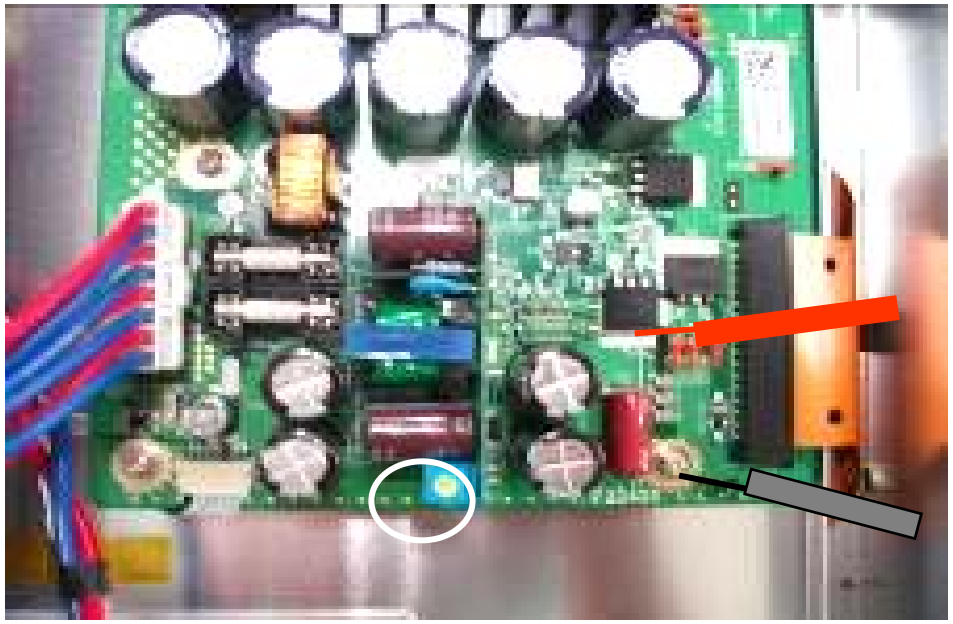


Y-BOARD **VSC C51 Both ends**
-Vy R36 Both ends

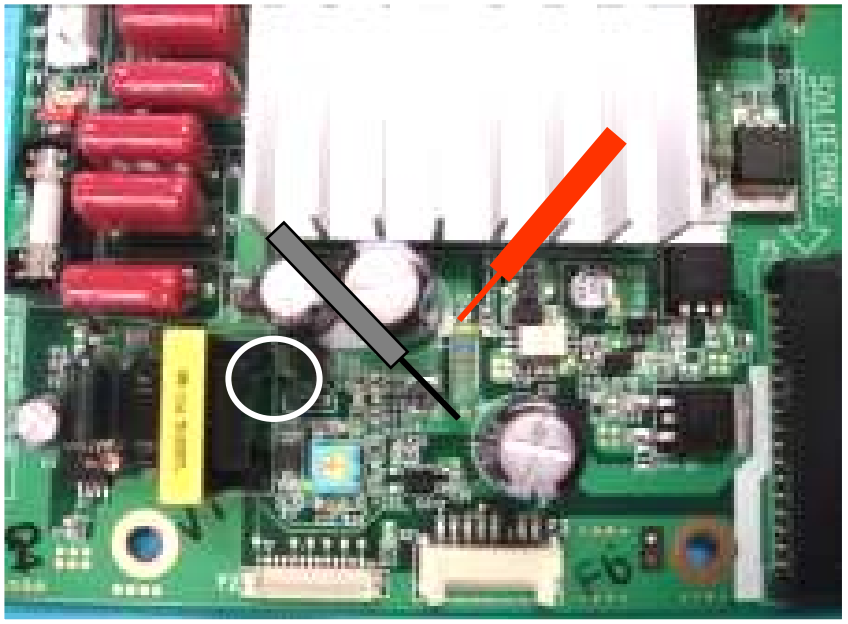


Y-BOARD **VSC R53 Both ends**
-Vy R78 Both ends

Z SUSTAIN Board VzBias Measurement



Z-BOARD Vzbias
GND-Q18



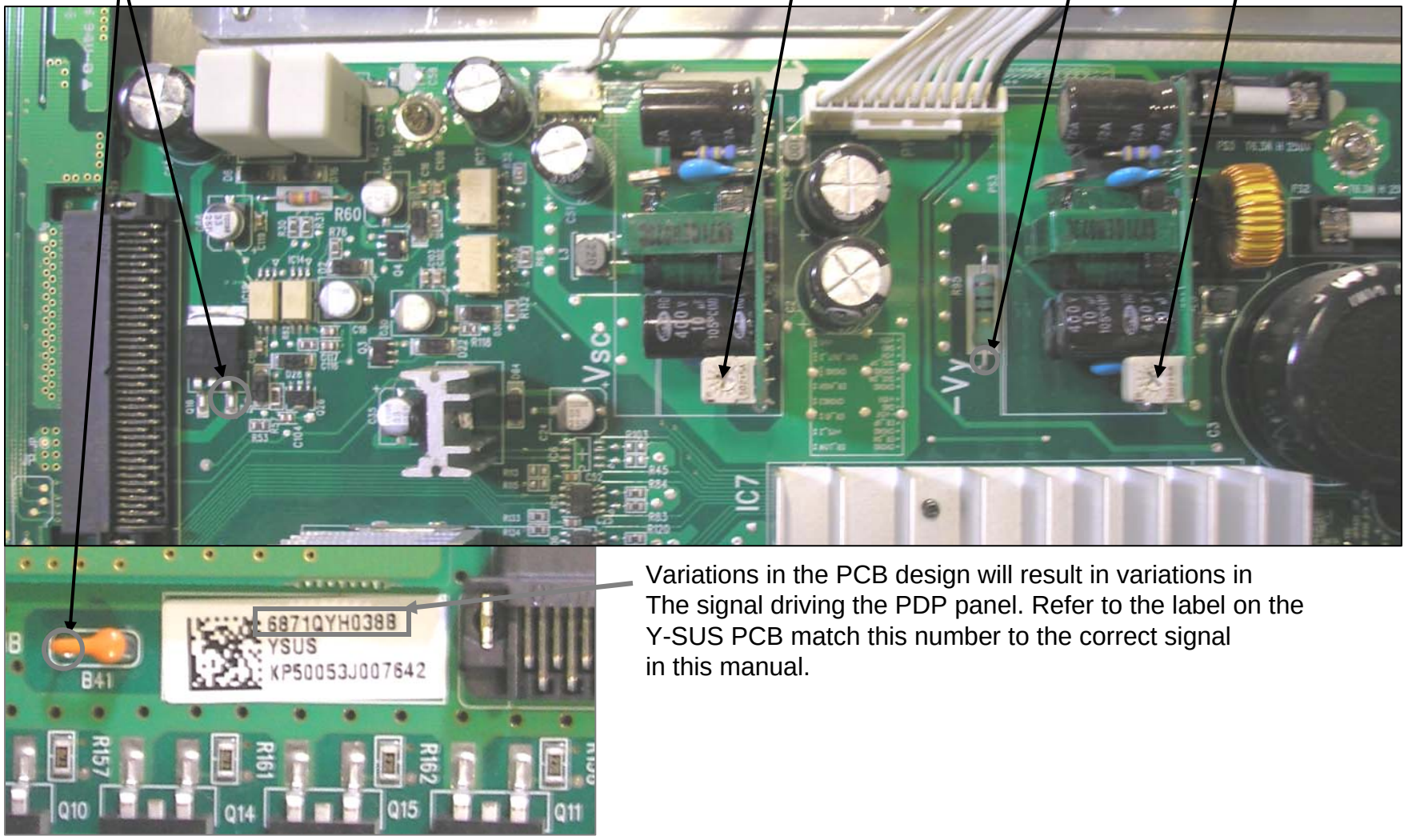
Z-BOARD Vzbias
R23 Both ends

DUAL SCAN PDP 50PX2

Waveform Test point

Vsc test point, Adjustment

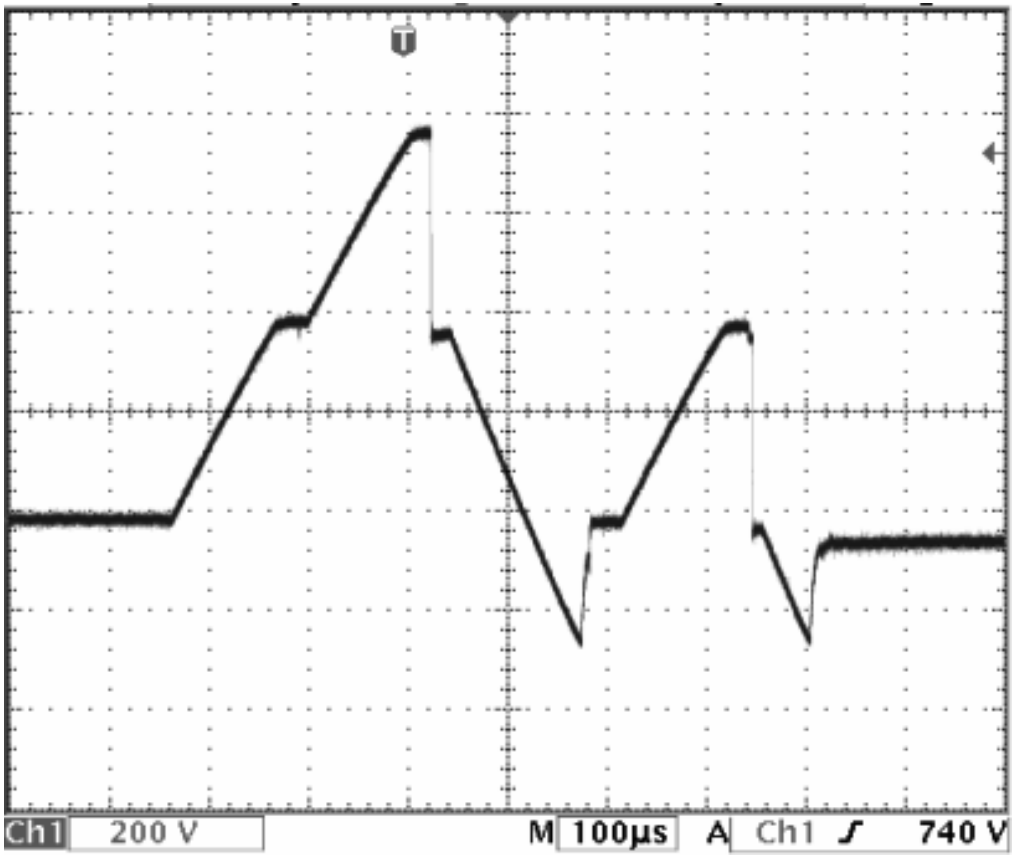
-Vy test point, Adjustment

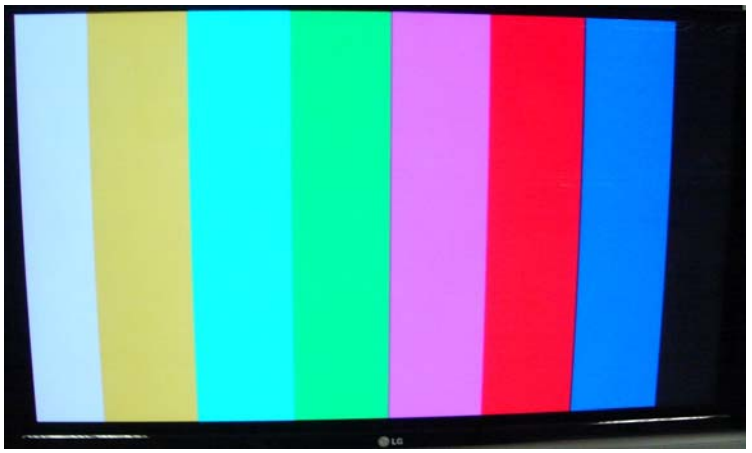


Variations in the PCB design will result in variations in The signal driving the PDP panel. Refer to the label on the Y-SUS PCB match this number to the correct signal in this manual.

DUAL SCAN PDP 50PX2

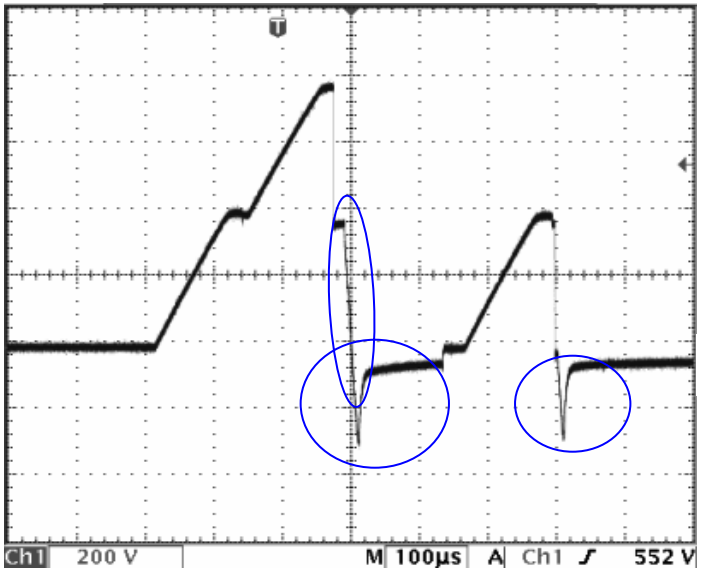
Normal Y-SUS PCB #**038C**

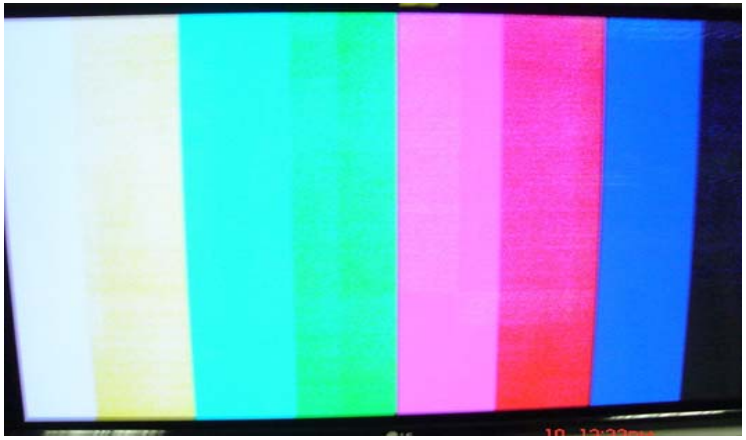




DUAL SCAN PDP 50PX2

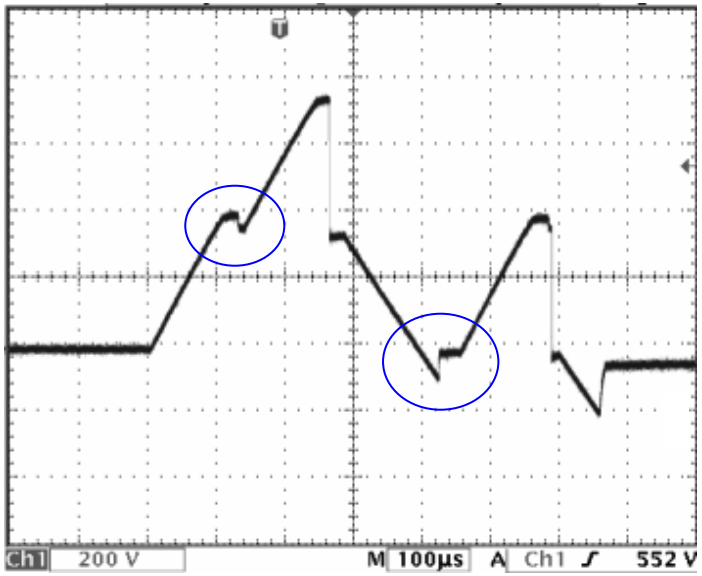
V-Set DN too low

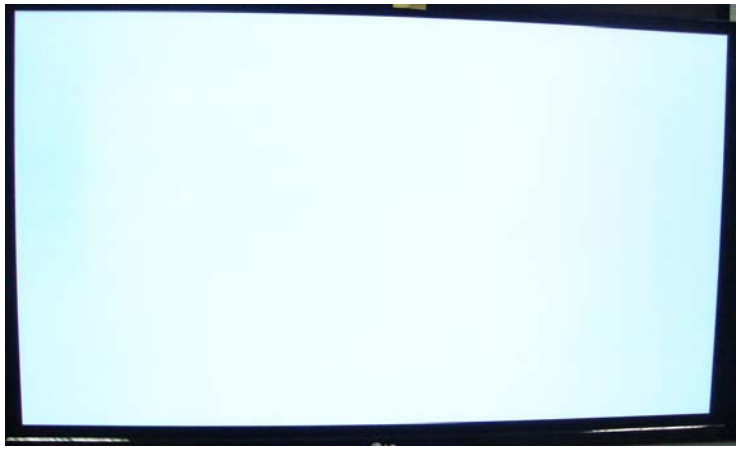




All of the center washes out due to decreased **Vset_DN** time.

V-Set DN too high

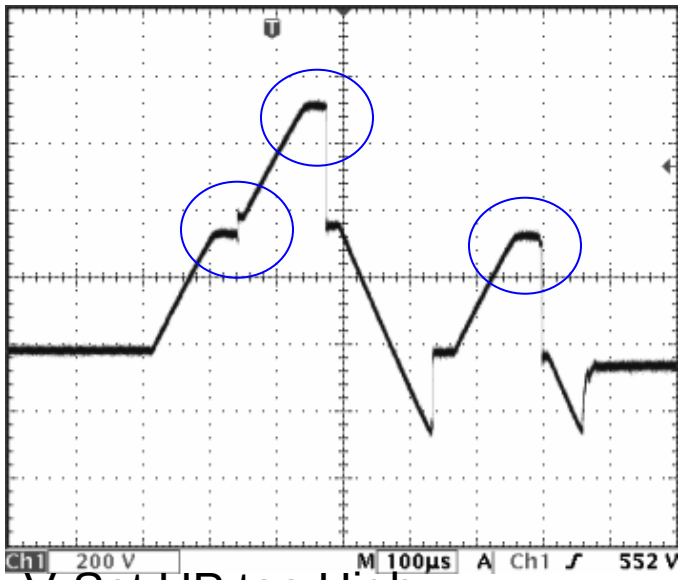


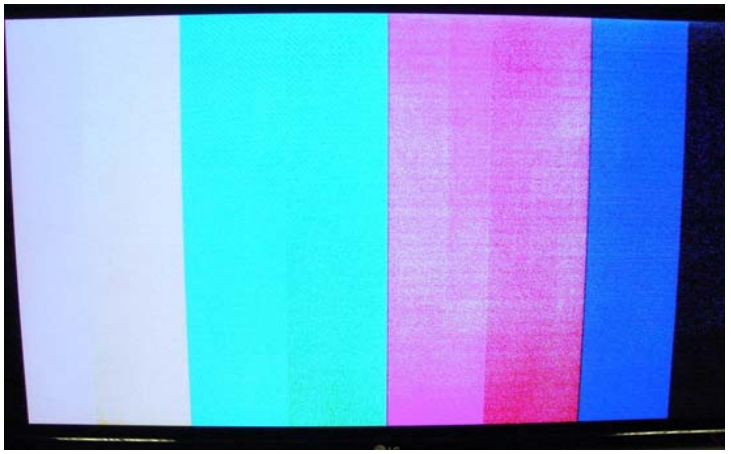


The center begins to wash out and arc due to decreased **Vset_DN** time.

DUAL SCAN PDP 50PX2

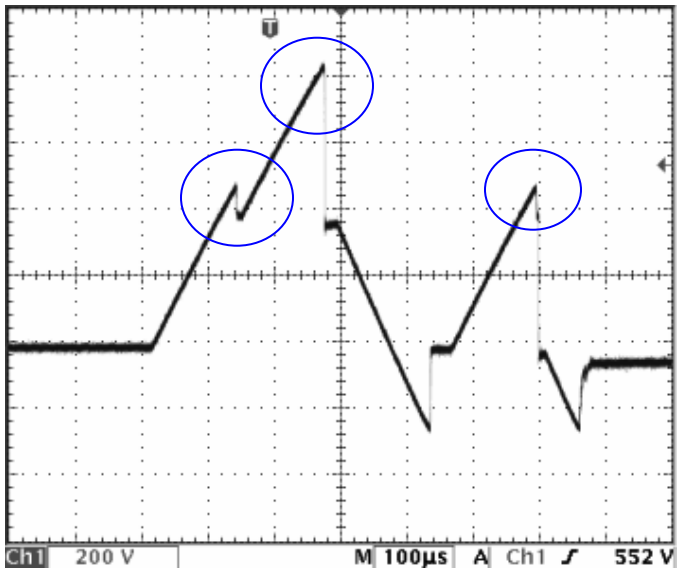
V-Set UP too Low

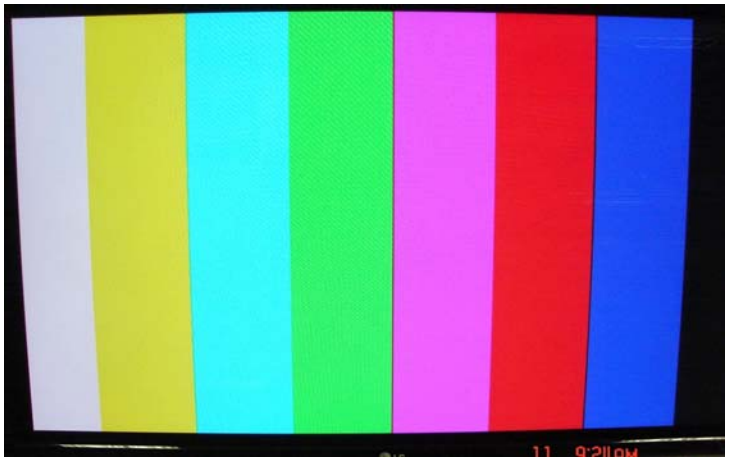




The center begins to wash out and ark due to **Vset_UP** Peeking too late and alters the start of the **Vset_DN** phase.

V-Set UP too High

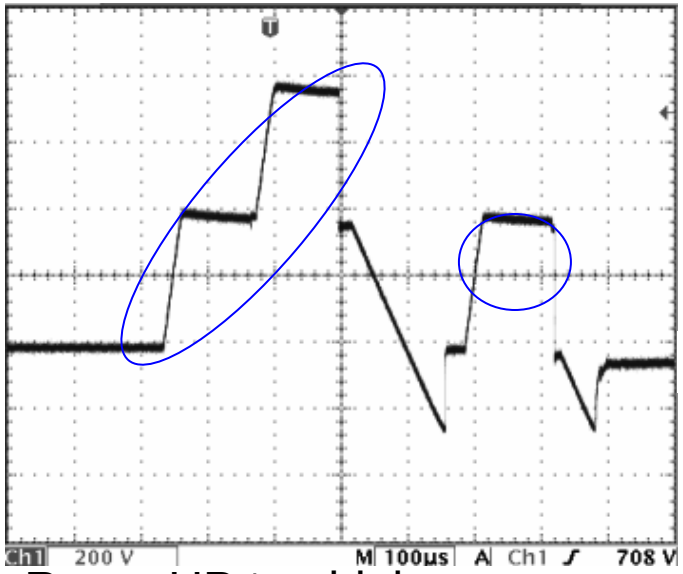


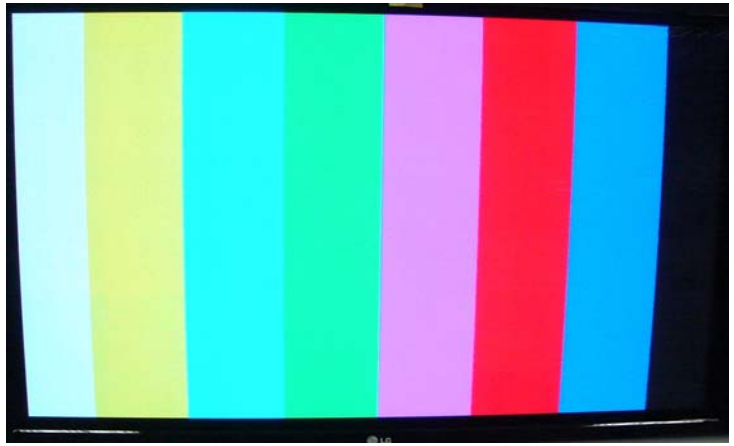


Very little alteration to the picture, the wave form indicates a distorted **Vset_UP**. The peek widens due to the **Vset_UP** peeking too quickly.

DUAL SCAN PDP 50PX2

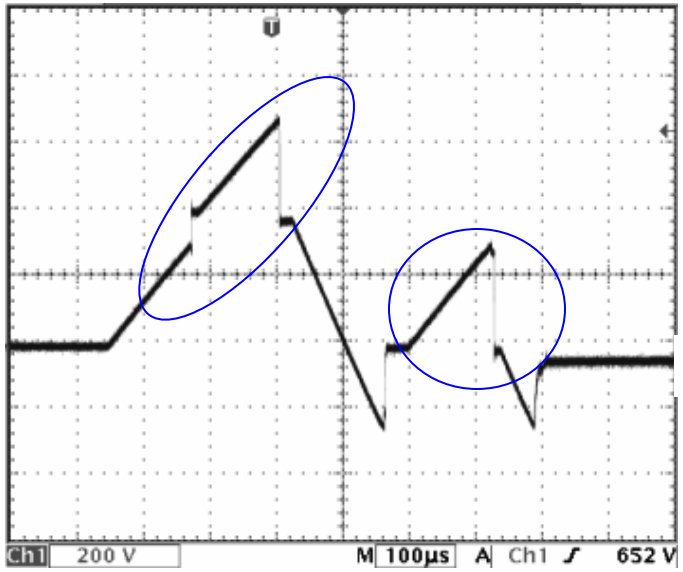
Ramp-UP too low

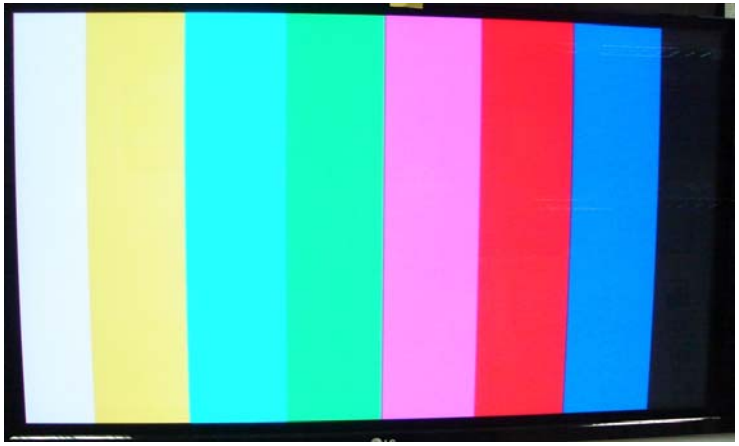




Noticeable low level color distortion with the **Ramp_up** too low.

Ramp-UP too high

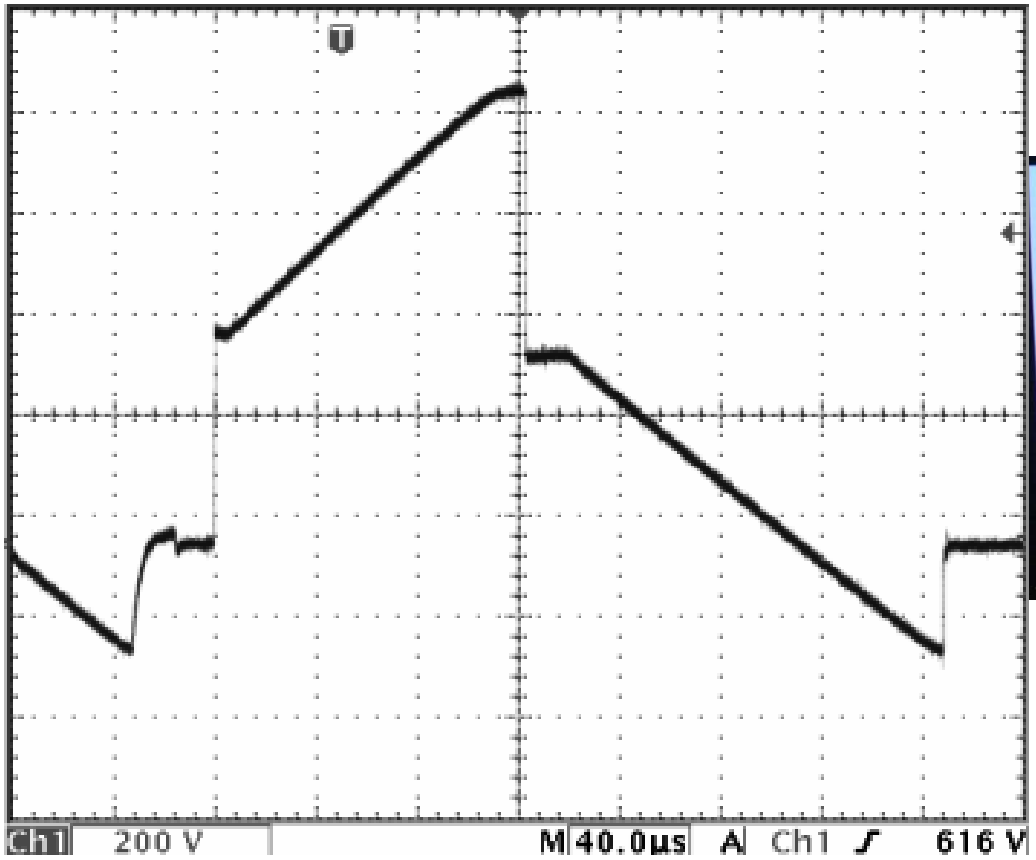


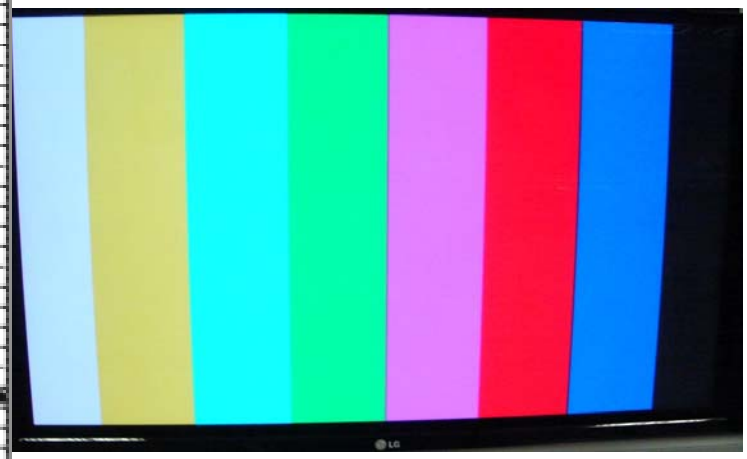


Noticeable low level color distortion with the **Ramp_up** too high.

DUAL SCAN PDP 50PX2

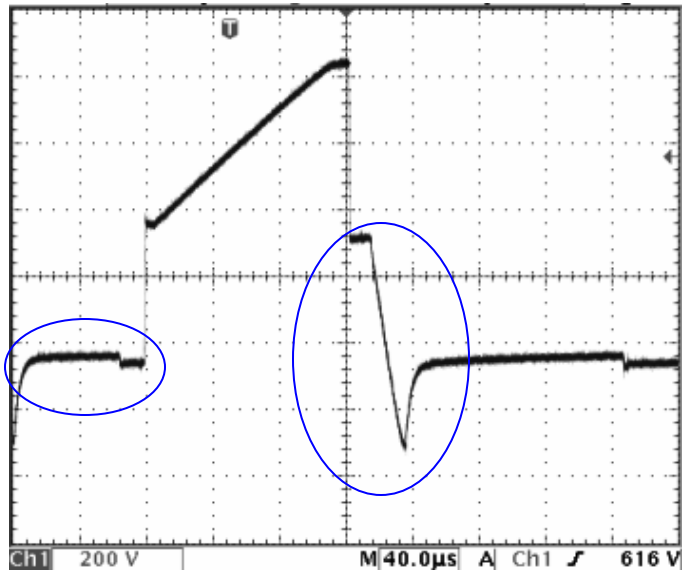
Normal Y-SUS PCB #**038B**

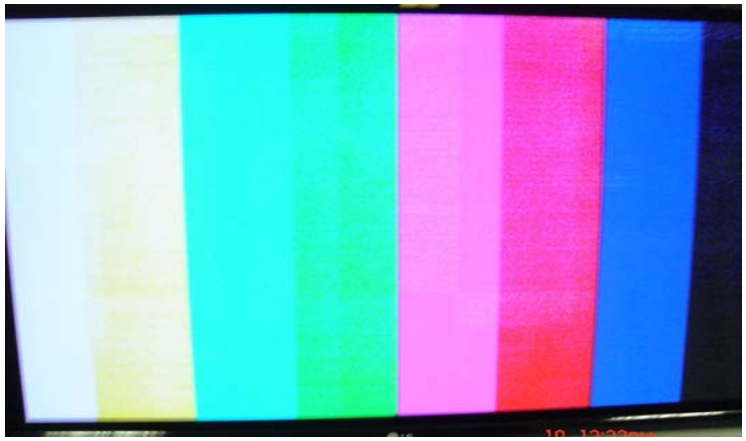




DUAL SCAN PDP 50PX2

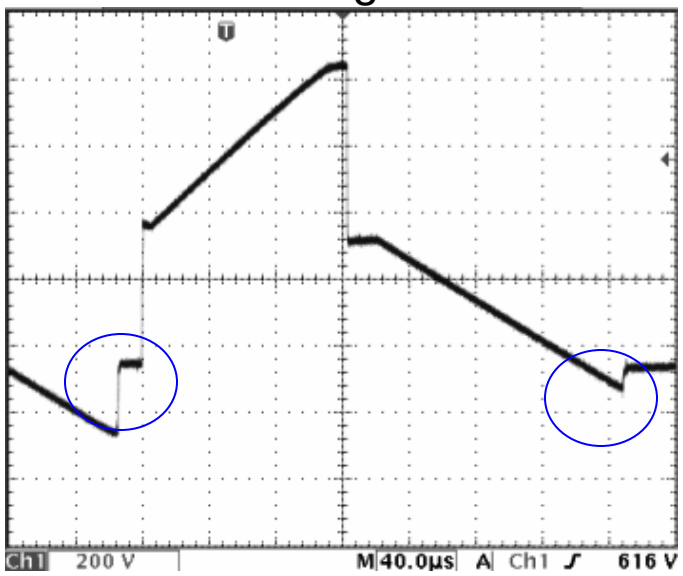
Vset-DN too low

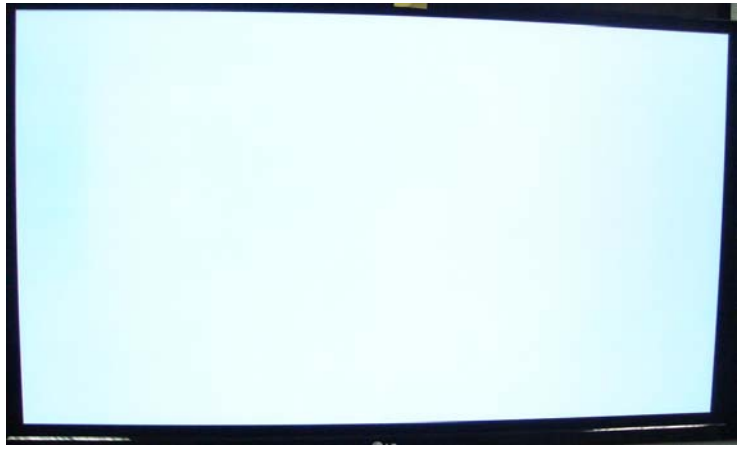




All of the center washes out due to decreased **Vset_DN** time.

Vset-DN too high

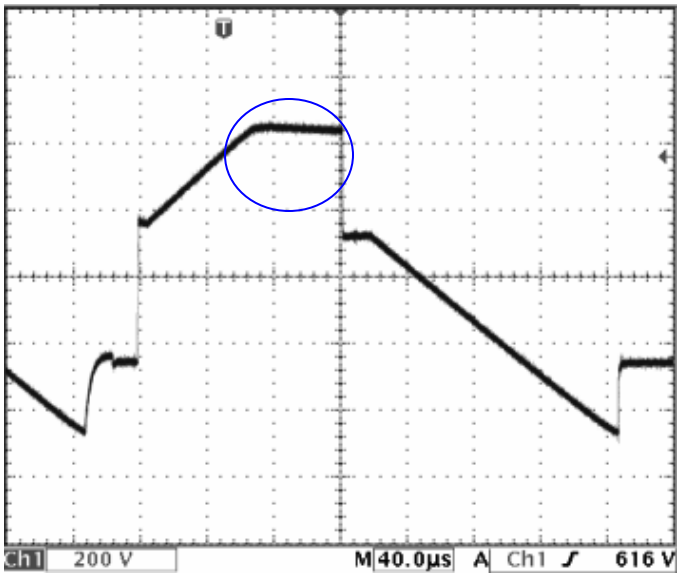


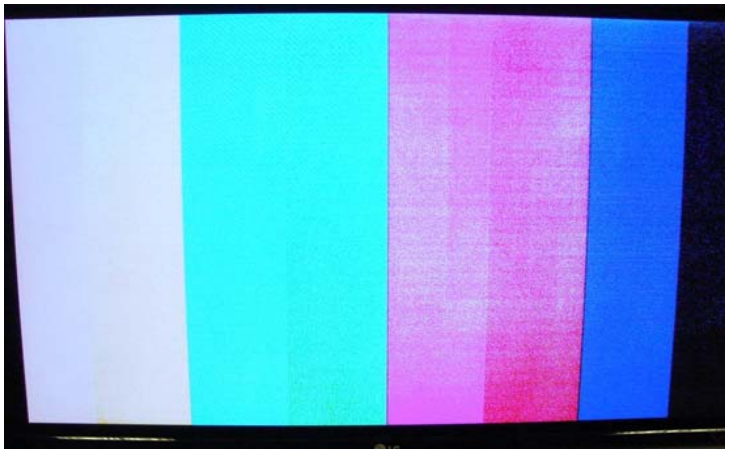


The center begins to wash out and arc due to decreased **Vset_DN** time.

DUAL SCAN PDP 50PX2

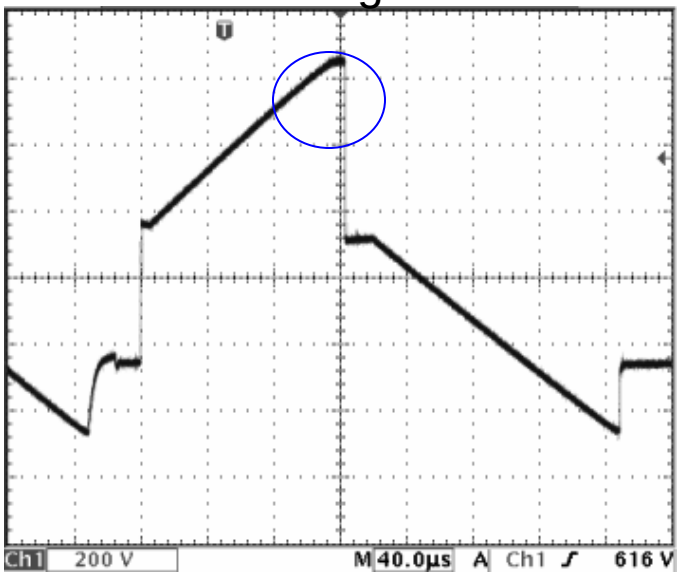
Vset-UP too low

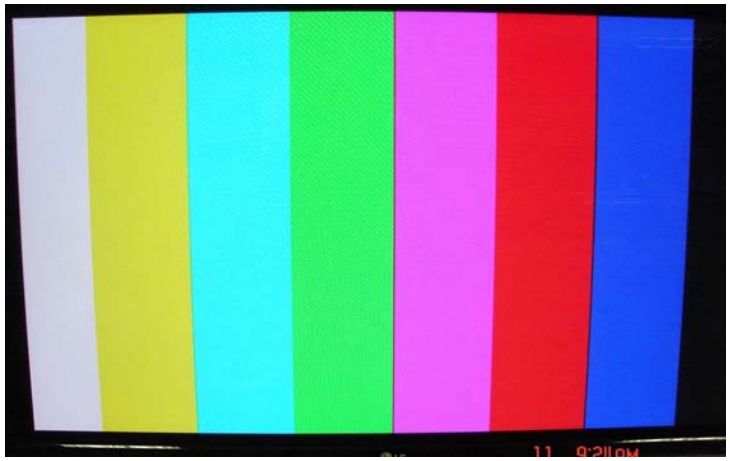




The center begins to wash out and ark due to **Vset_UP** Peeking too late and alters the start of the **Vset_DN** phase.

Vset-UP too High

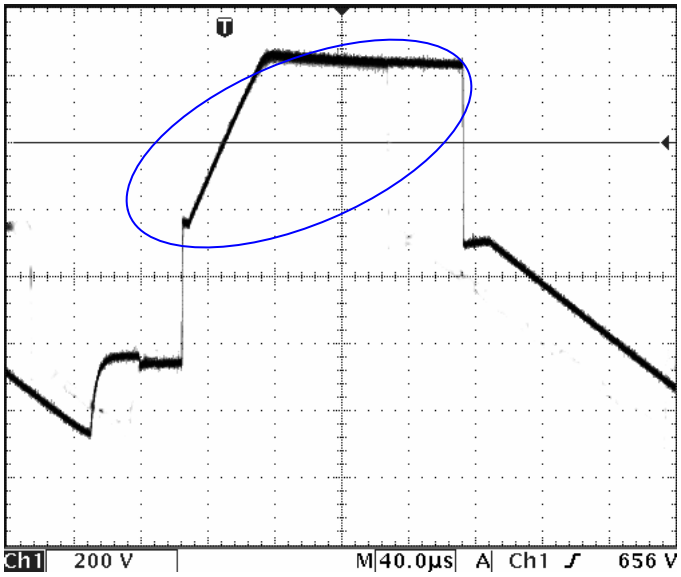


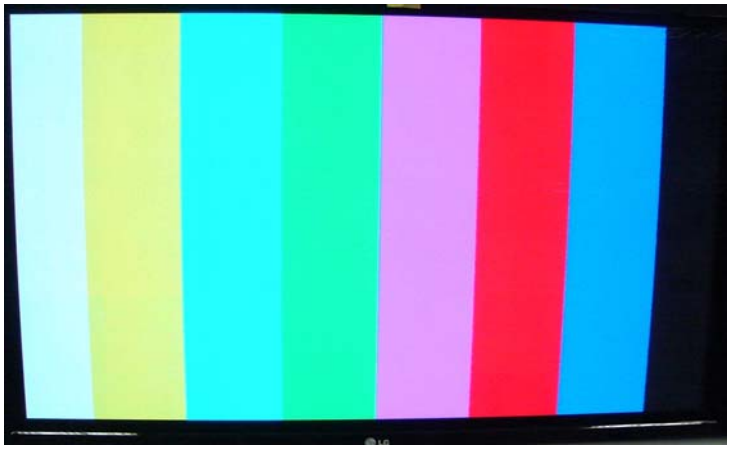


Very little alteration to the picture, the wave form indicates a distorted **Vset_UP**. The peek widens due to the **Vset_UP** peeking too quickly.

DUAL SCAN PDP 50PX2

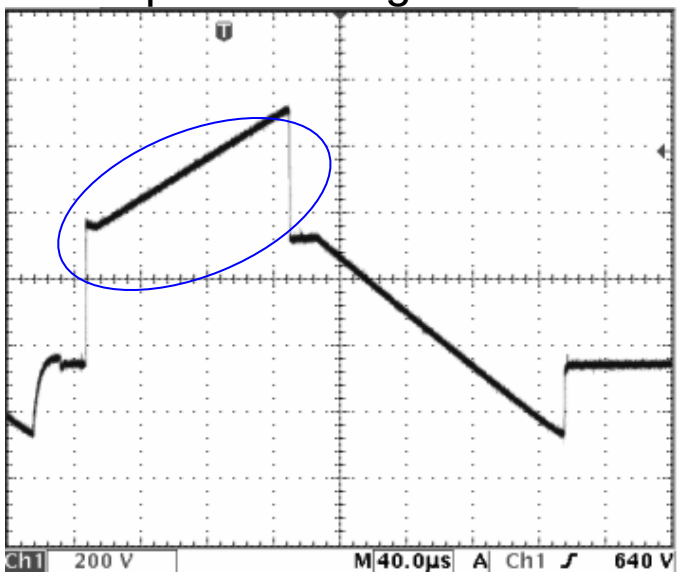
Ramp-UP too low

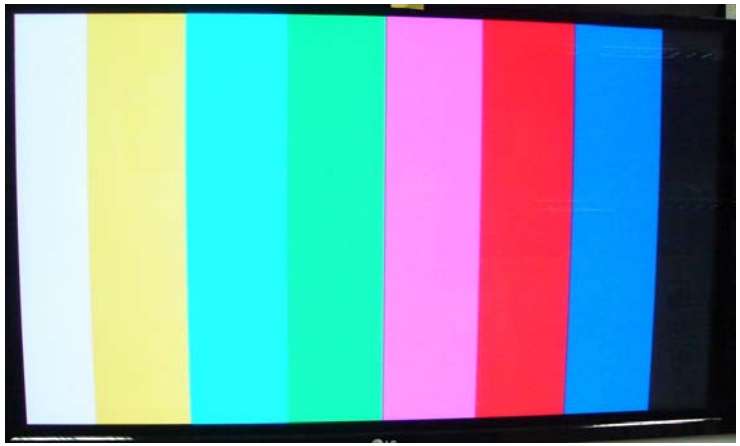




Noticeable low level color distortion with the **Ramp_up** too low.

Ramp-UP too high





Noticeable low level color distortion with the **Ramp_up** too high.

DVR Operation and Troubleshooting

Theory of Operation

Hard Drives the Beginning

Hard disks were invented in the 1950s. They started as large disks up to 20 inches in diameter holding just a few megabytes. They were originally called "fixed disks" or "Winchesters" (a code name used for a popular IBM product). They later became known as "hard disks" to distinguish them from floppy disks. Hard disks have a hard platter that holds the magnetic medium, as opposed to the flexible plastic film found in tapes and floppies.

HDD, circa 1979 - an early 8" disk

Hard Drives Today

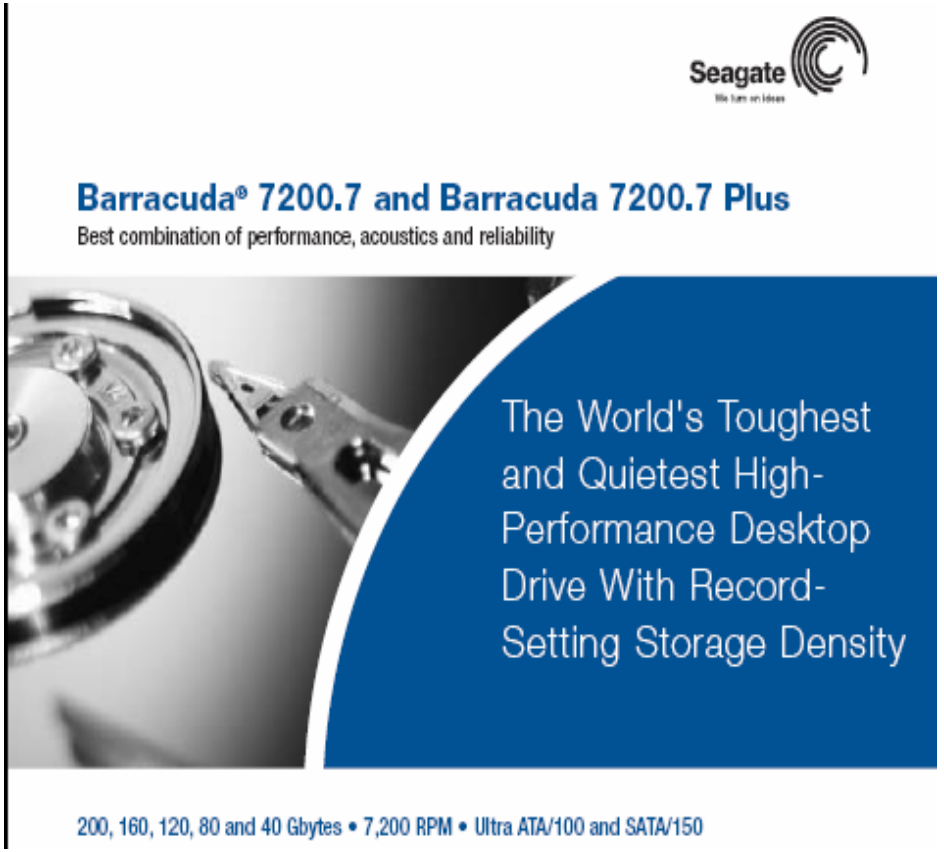
Hard drives have now become very small and can store massive amounts of data. As of 2005, over 98% of the world's hard disks are manufactured by just a handful of large firms: Seagate, Maxtor (acquired by Seagate in May 2006), Western Digital, Samsung, and Hitachi which owns the former disk manufacturing division of IBM.

2.5 inch laptop hard disk

LG uses Seagate Hard Drives

The 160 Gigabyte Barracuda Hard Drive from Seagate is built into several models of LG televisions and provides about 15 hours of HDTV recording or 66 hours of SDTV recording without the need of any external accessories.

It is a 3.5 inch serial ATA (Advanced Technology Attachment) Hard Drive.


Seagate
Barracuda® 7200.7 and Barracuda 7200.7 Plus
Best combination of performance, acoustics and reliability
The World's Toughest and Quietest High-Performance Desktop Drive With Record-Setting Storage Density
200, 160, 120, 80 and 40 Gbytes • 7,200 RPM • Ultra ATA/100 and SATA/150

Recent Hard Drive Upgrade

In addition the grommets for HDD mounting have been changed to P/N 5040V00101B

***Rubber changed from hard material to soft material**

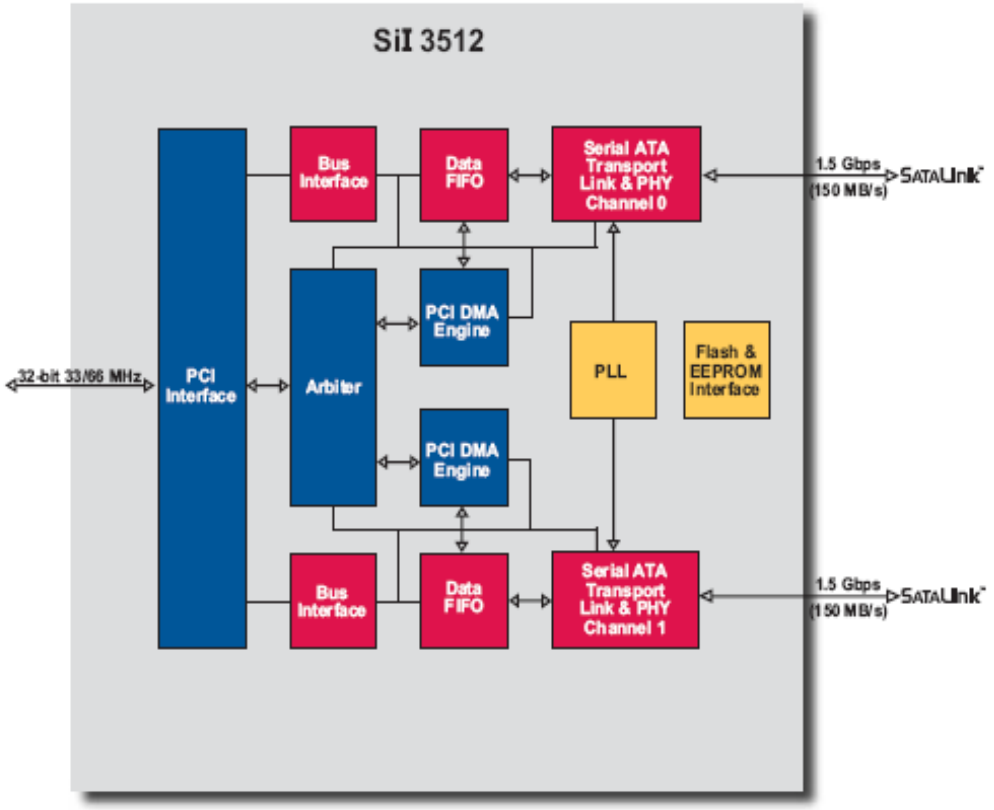
LG recently started replacing the HDD that was designed for PC use (P/N:6744B00040A) with a low-noise HDD designed for A/V use (P/N:6744B91953A). The original HDD is shown on the right and the upgraded version is shown on the left.

Hard Drive Control

The HDD is controlled by IC1002 on the digital board

Hard Drive Control

The SiI3512 is a single-chip PCI to 2-port Serial ATA host controller. Based on a 32-bit 66 MHz PCI interface, the SiI3512 provides support for two independent Serial ATA devices. The second Serial ATA output is used to control the memory card reader if the unit has that option.

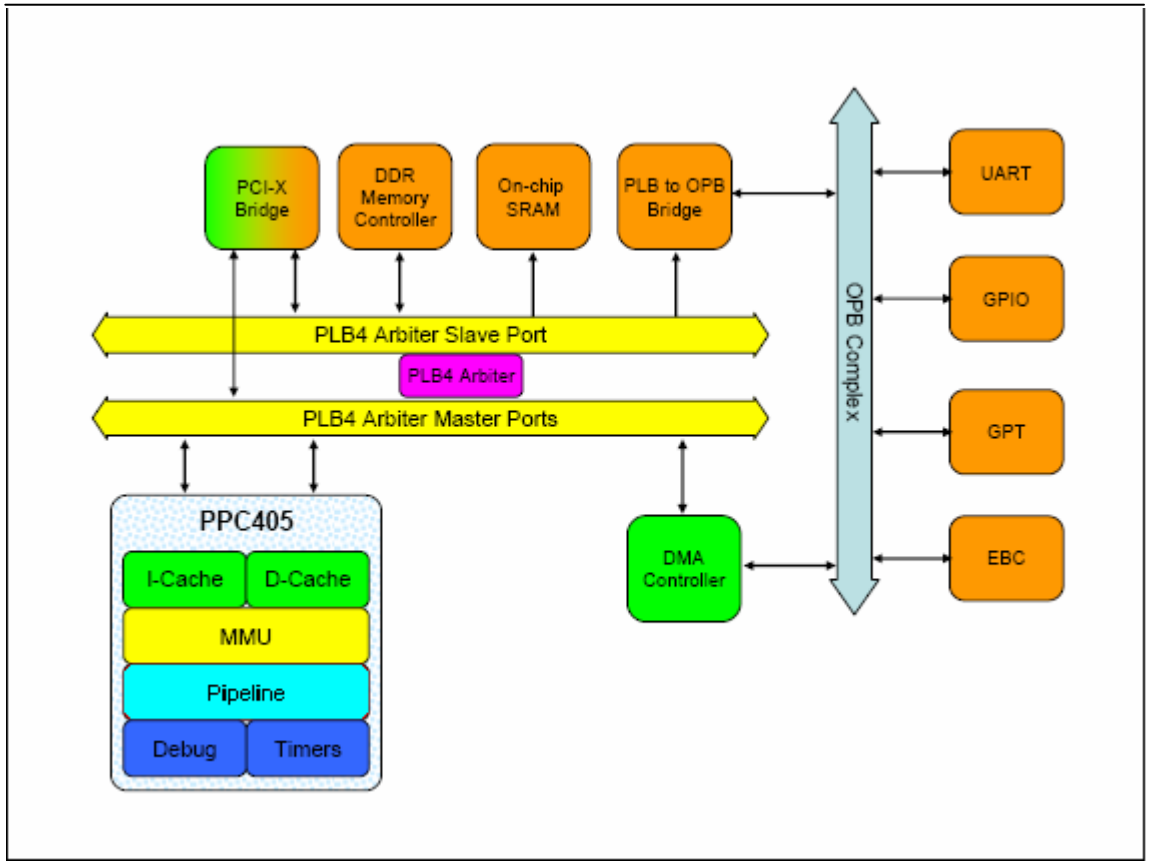


CPU

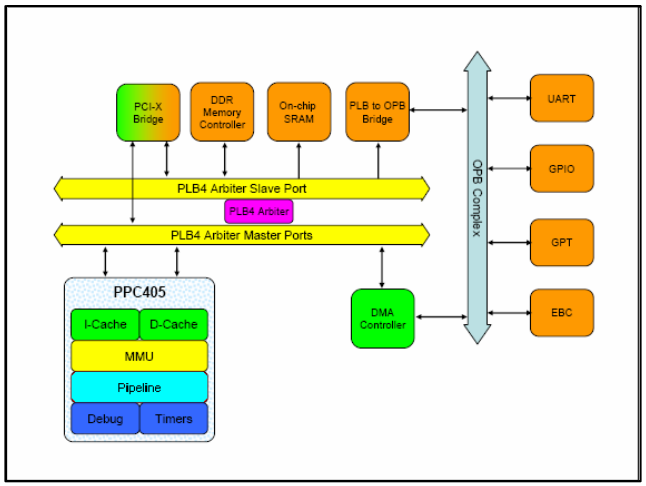
IC100 is the AMCC PowerPC. It controls the Serial Host controller IC1002.

CPU

The 405 CPU core is 100% PowerPC compatible and possesses all of the qualities necessary to make powerful and cost effective system-on-a-chip designs a reality. Optimized interfaces to the Core Connect bus structure provide for a high bandwidth, low latency system interface solution.

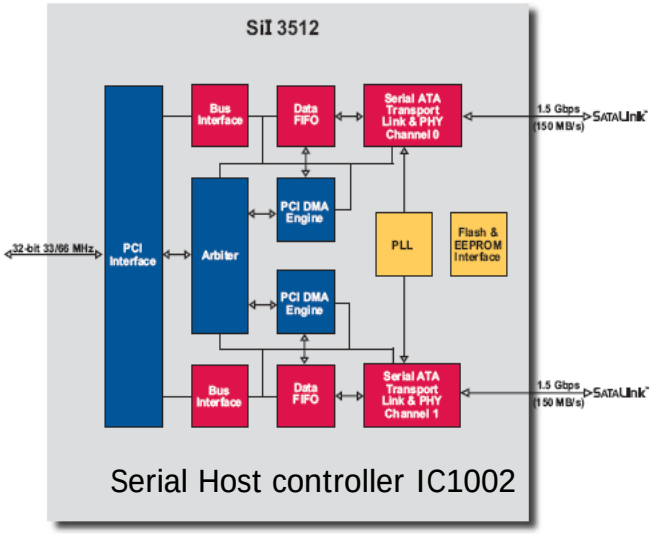


Let’s put it all together



CPU IC100

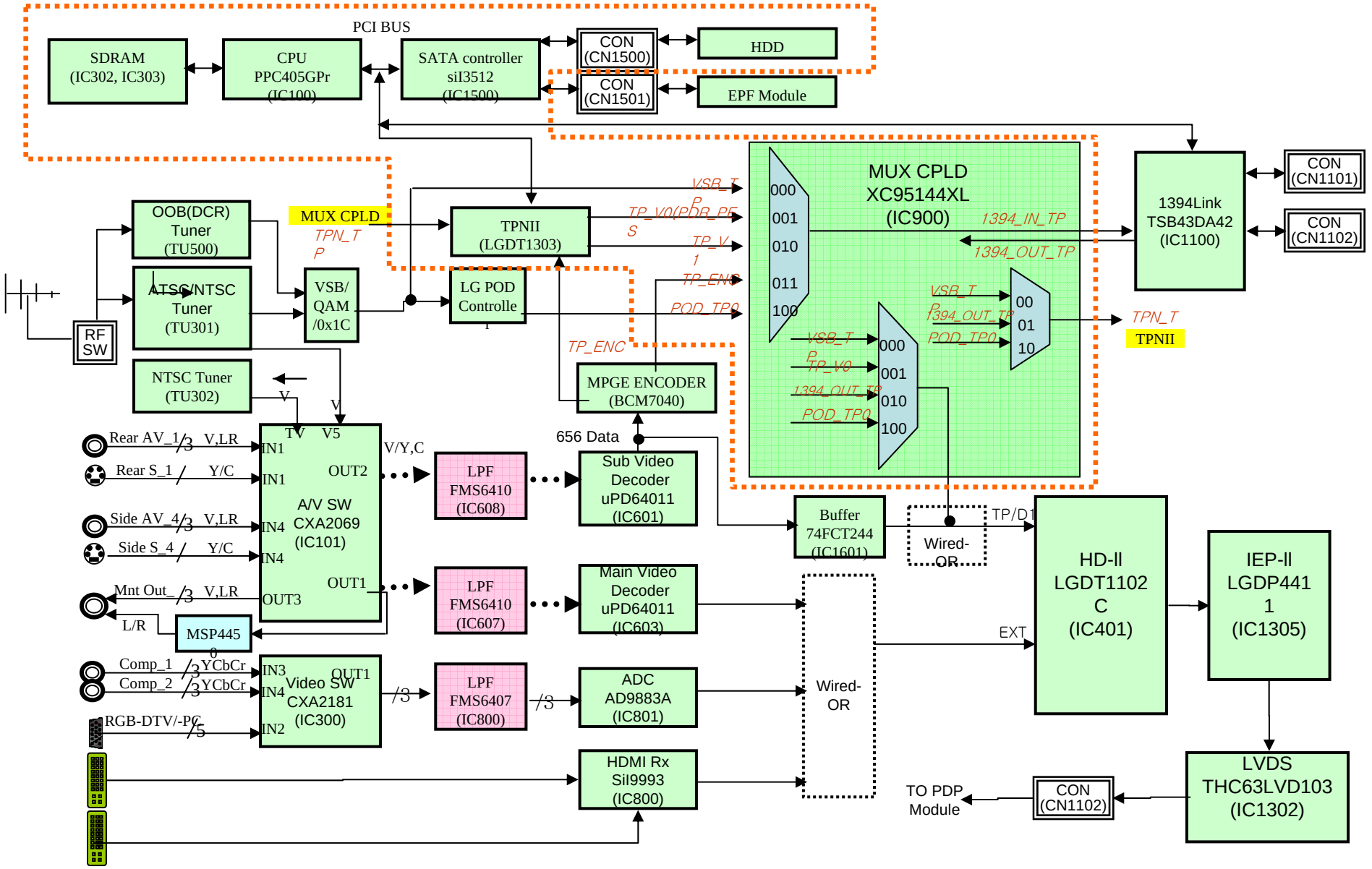
PCI Bus



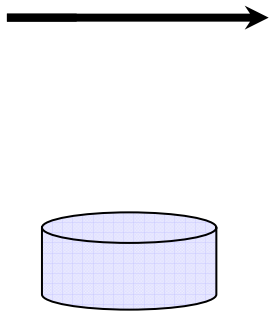
Serial Host controller IC1002

Serial ATA Bus

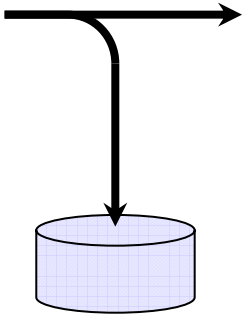
50/60PY2DR-UA VIDEO PATH - DVR



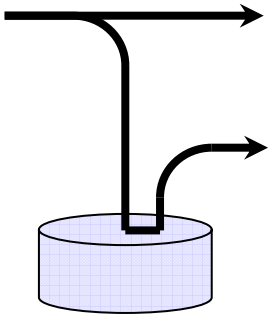
Here's what we can do



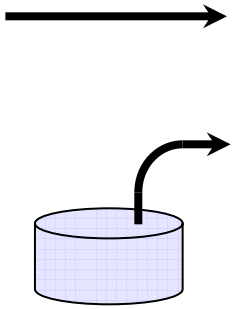
Watch Live TV
Without buffering



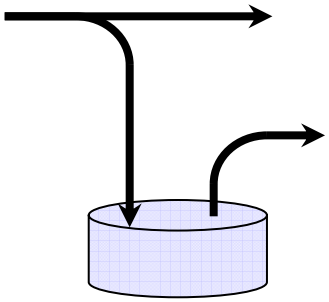
Watch Live TV with
1 hour buffering



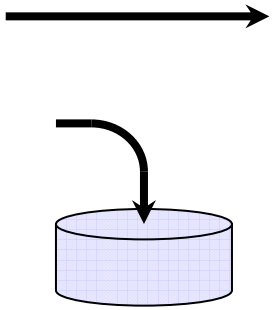
Watch Delayed Live
TV (1 hour max)



Play Recorded show



Record one show and
play a recorded show



Record one show and
watch another live **

** You can only record or watch one Digital Channel at a time however you can record one Analog Channel and watch another Analog Channel at the same time.

X Studio is the Customer Interface to the DVR

X Studio is on
DR and DRA series
Plasma and LCD

• Home Menu Consists of:
- Recorded TV
- TV Guide
- Schedule
- Manual Rec
- TV Menu

• Home Menu Consists of:
- Recorded TV
- Photo List
- Music List
- TV Guide
- Reservation
- IEEE 1394
- TV Setup

• When you press X Studio, it displays the home menu with whatever was highlighted last.

• In home menu the HDD free space is displayed at the top.

• When you select TV menu or TV Setup the traditional TV Menu is displayed.

X Studio Pro is on
PY series Plasma

• In home menu, use ▲/▼ button and then ENTER or ▶button to select.
• Press the Xstudio or EXIT button to remove the OSD.

HDD Free Space is only an estimate

* This is a completely blank HDD

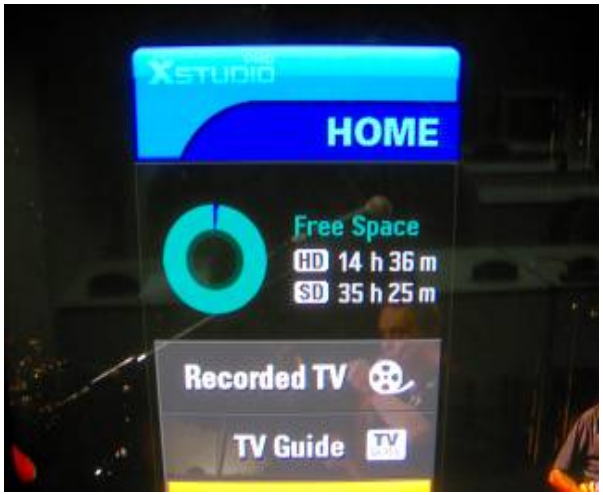
Record 1 hour of SDTV (480I)

Because video compression is used you can see that the HDD only shows 12 minutes of HD time or 27 minutes of SD time has been used to Record 60 minutes of SDTV

Record 1 hour of HDTV (1080I)

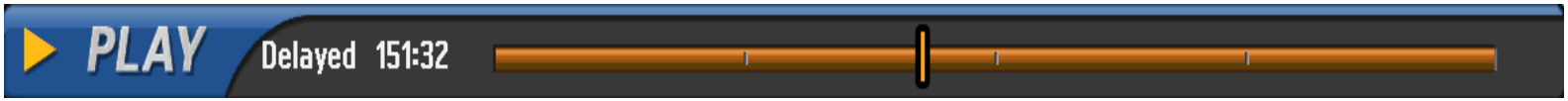
In this case you can see that the HDD shows 34 minutes of HD time but 84 minutes of SD time has been used to record 60 minutes of HDTV

NOTE: These times will vary



The Progress Bar

The Progress Bar can be brought up at any time by pressing the ENTER button
To make the Progress Bar disappear you can either press ENTER again, press EXIT or simply wait about 10 seconds



The bar will be blue during delayed playback

The bar will be red during recording

The bar will be green during playback of a recorded show

HDD ERROR MESSAGES

Timer Recording Fail-1

Message	Note
Timer recording cannot start due to HDD error.	HDD problem. Bad sector or bad connection or other
Timer recording cannot start due to bad signal.	Signal strength is too weak to start recording
Timer recording cannot start. No recording space.	HDD recording space is full
Timer recording cannot start. Reached maximum number of recordings.	Maximum number of recorded program is 500. User must delete recorded program to start record.
Timer recording cannot start. Please set current time.	Current time must be set before timer recording starts
Timer recording cannot start. Channel is invalid.	Channel number is invalid
Timer recording cannot start. Copy protected.	Current Program is copy protected
Timer recording cannot start. DVR device error.	Device problem. Hardware error occurred.
Cannot display Auto Demo when timer recording starts.	starting timer recording. Auto Demo can start once recording is started.
Cannot display Photo List when timer recording starts.	starting timer recording. Photo list can start once recording is started.
Cannot display Music List when timer recording starts.	starting timer recording. Music list can start once recording is started.
Stop current recording to start timer recording.	Current recording must be stopped before timer recording.
Stop current playback to start timer recording.	Current playback must be stopped before timer recording.
Set current time for timer recording.	Current time must be set before timer recording starts

Timer Recording Fail-2

Message – timer record failed programs in RecordedTv list	Note
Timer record failed due to no disk space.	HDD recording space is full
Timer record failed due to no signal.	Signal strength is too weak
Timer record failed due to DVR device error.	Device problem. Hardware error occurred.
Timer record failed. Reached maximum number of recordings.	Maximum number of recorded program is 500. User must delete recorded program to start record.
Timer record failed. Recording duration is less than 10 seconds.	Record length must be longer than 10 seconds
Timer record failed. Temperature is below zero.	Temperature is too low
Message – timer record failed programs in Gemstar PlayList	**Note**
Timer record failed due to no disk space. Do you want to delete?	HDD recording space is full
Timer record failed due to no signal. Do you want to delete?	Signal strength is too weak
Timer record failed due to DVR device error. Do you want to delete?	Device problem. Hardware error occurred.
Timer record failed. Reached maximum number of recordings. Do you want to delete?	Maximum number of recorded program is 500. User must delete recorded program to start record.
Timer record failed. Recording duration is less than 10 seconds. Do you want to delete?	Record length must be longer than 10 seconds
Timer record failed. Temperature is below zero. Do you want to delete?	Temperature is too low

Recorded Program Error

Message - From Gemstar Guide PlayList	Note
Cannot play Recorded Program due to bad sector. Do you want to delete?	HDD bad sector. Select “YES” to delete the program
Cannot play Recorded Program due to copy protection. Do you want to delete?	copy protected. Select “YES” to delete the program
Cannot play recorded program due to file error. Do you want to delete?	Cannot find A/V file. Select “YES” to delete the program
Message - From RecordedTv List	Note
Cannot play Recorded Program due to bad sector.	HDD bad sector.
Cannot play Recorded Program due to copy protection.	copy protected.
Cannot play recorded program due to file error.	Cannot find A/V file
HDD playback stops because of HDD problem.	HDD problem. Bad sector or bad connection or other
HDD playback stops, cannot save clip editing because of HDD problem.	HDD problem. Clip edit is not saved
HDD playback halts due to HDD problem. HDD Recovery begins.	HDD error recovery program has started
Delete a program which has been played because of HDD problem.	Fatal DVR error a HDD data is deleted
Delete all recorded programs because of DVR problem.	Fatal DVR error all HDD data is deleted

Recording Operation Error

Message	Note
Recording halts due to HDD problem.	HDD problem. Recording stops
Stop recording due to copy protection.	Copy protection detected during recording.
Cannot record due to copy protection.	Copy protection detected before recording starts.
Do you want to stop recording before power off?	“Yes” will stop record. “No” will continue record. In both cases, display will be turned off
Recording stops as recording space is full	HDD recording space is full
Recording stopped. Recovering from HDD error.	HDD error recovery program has started
Recording stopped. No recording space.	HDD recording space is full
Reached maximum recording duration.	Cannot add record duration if current record duration is 5hr or bigger.
Invalid input signal for recording.	Record is possible for only RF, Composite and 1394 signal
Recording halts. HDD recovery will begin.	HDD error recovery program starts
Recording cannot start No recording space.	HDD recording space is full
Recording failed. Length is less than 10 seconds.	Record length must be longer than 10 seconds
Reached maximum number of recordings.	Maximum number of recorded program is 500. User must delete recorded program to start record.
Cannot change to another digital channel while recording digital channel.	Watching digital channel while recording another digital channel is not possible

Timeshift Operation Error

Message	Note
Timeshift stops because of HDD problem.	HDD problem. Bad sector or bad connection or other
Timeshift cannot start. Audio only program.	Cannot Timeshift audio only channel
Timeshift cannot continue. Audio only program.	Cannot Timeshift audio only channel
Timeshift halts due to HDD problem. HDD Recovery begins.	HDD problem. Bad sector or bad connection or other
Stop time shift due to copy protection.	Current Program is copy protected
Cannot time shift due to copy protection.	Current Program is copy protected

Editing Operation Error

Message	Note
Editing failed. Length is less than 10 seconds.	Each clip edit length must be longer than 10 seconds
Editing failed. Length is less than 10 seconds. HDD playback stops.	
Reached maximum number of clip editing's.	Maximum number of clip editing is 10.

Rename

Message	Note
Please input new title.	Must type new title
First character must be 0~9, a~z, A~Z. Please change new title.	First character must be 0~9, a~z, A~Z
Folder with the same name exist.	Must change folder name. same folder already exists
Reached maximum number of characters.	Maximum number of character is 16.

Others

Message	Note
No HDD is detected. Please contact customer service h	HDD connection error.
Not enough HDD space.	HDD is full
Buffering stopped. Recovering from HDD error.	HDD error recovery program has started
Cannot enter DVR Mode in current input source.	DVR mode is possible for only RF, Composite and 1394 signal
Cannot play recorded program.	Recorded program A/V file error
HDD is not detected. Please contact service center.	Unknown HDD detection error.
No signal for DVR function.	Signal is too weak to enter Recording or Timeshift
Invalid input signal for DVR function.	DVR mode is possible for only RF, Composite and 1394 signal

Memory card

Message	Note
Unable to create folder. Reached maximum number of folders.	Maximum number of folder is 30.
Unable to create folder. No disk space.	HDD is full. Must delete a program/photo/music before record.
First stop copying and retry M/C eject.	Cannot eject while copy operation is in progress
Copy protected. Unable to copy.	Cannot copy to memory card because it is copy protected.
Not enough memory card space.	Cannot copy to memory card because free space is too small.
No memory card.	Memory card not detected
Unable to copy file.	Cannot copy
Unable to move file.	Cannot move
Unable to delete file.	Cannot delete
Unable to read file.	Cannot read
Unable to access. File or directory damaged.	Damaged file or memory card
Can't read data. Please remove memory card 1.	memory card 1 is not detected correctly
Can't read data. Please remove memory card 2.	memory card 2 is not detected correctly
Memory card 1 removed unsafely.	Must press eject button and select memory card before removing
Memory card 2 removed unsafely.	Must press eject button and select memory card before removing

HDD Recovery

Message	Note
Bad sector occurred in critical regions of photo drive. Do you want to format photo drive?	Bad sector. Format photo-list
Bad sector occurred in critical regions of music drive. Do you want to format music drive?	Bad sector. Format music-list
Bad sector occurred in critical regions of HDD. Do you want to format HDD?	Bad sector. Format HDD
DVR initialization has failed.	DVR initialization error.
DVR device error.	DVR hardware error.
DVR needs HDD Initialization. Do you want to perform?	“Yes” will start DVR re-initialization.
HDD recovery is in progress. Please try again later.	HDD error recovery program in progress
HDD recovery has failed. Please contact service center.	Unknown HDD detection error.
HDD initialization is in progress. Please try again later.	DVR initialization in progress
DVR initialization cannot start because of low temperature.	DVR initialization cannot start.
HDD recovery begins.	HDD error recovery program starts
Do you want to format HDD?	HDD error. “Yes” will start format
HDD format has failed. Please contact service center.	Unknown HDD detection error.
Processing HDD format.	HDD error recovery program started

TROUBLE SHOOTING

Eliminate the HDD

- If you suspect the HDD is causing a video or audio problem you can simply unplug it
- You MUST unplug the TV before disconnecting or reconnecting the HDD
- During initial power up the TV will detect whether or not the HDD is there and will route the audio and video as needed

DVR TROUBLE SHOOTING

1 Check HDD power cable

↓

2 Check HDD Signal Cable(SATA)

↓

3 Check SiI3512
Power pins, Osc, PCI Bus, LED150

↓

4 Check CPLD inputs
#140(CLK), #138(SOP), #137(Valid),
#139(Error),
#136(Data)

→ Check TPNII
LGDT1303

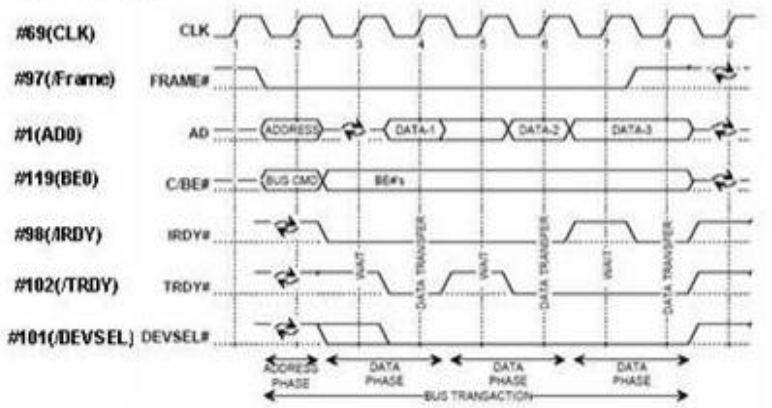
↓

5 Check CPLD outputs
#78(CLK), #75(SOP), #77(Valid),
#76(Error),
#79(Data)

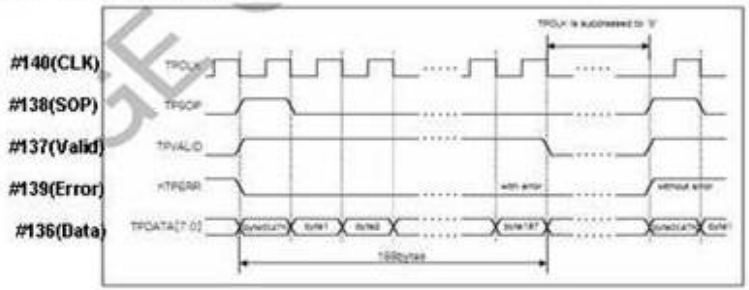
1 : _Check HDD Power cable, wafer(CN1707)
_#1 : 5V, #4 : 12V

2 : _Check HDD Signal cable(SATA), Wafer (CN1500)

3 : _ Check SiI3512 (IC1500) input : Power pins, Osc
_ Check LED150 blinking
_ Check PCI bus



4 : _ Check CPLD(IC900) inputs



7 : _Check CPLD(IC900) outputs : #78 (CLK), #75(SOP), #77(Valid), #76(Error), #79(Data)
_ signal shape is same(above)

Life's Good
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